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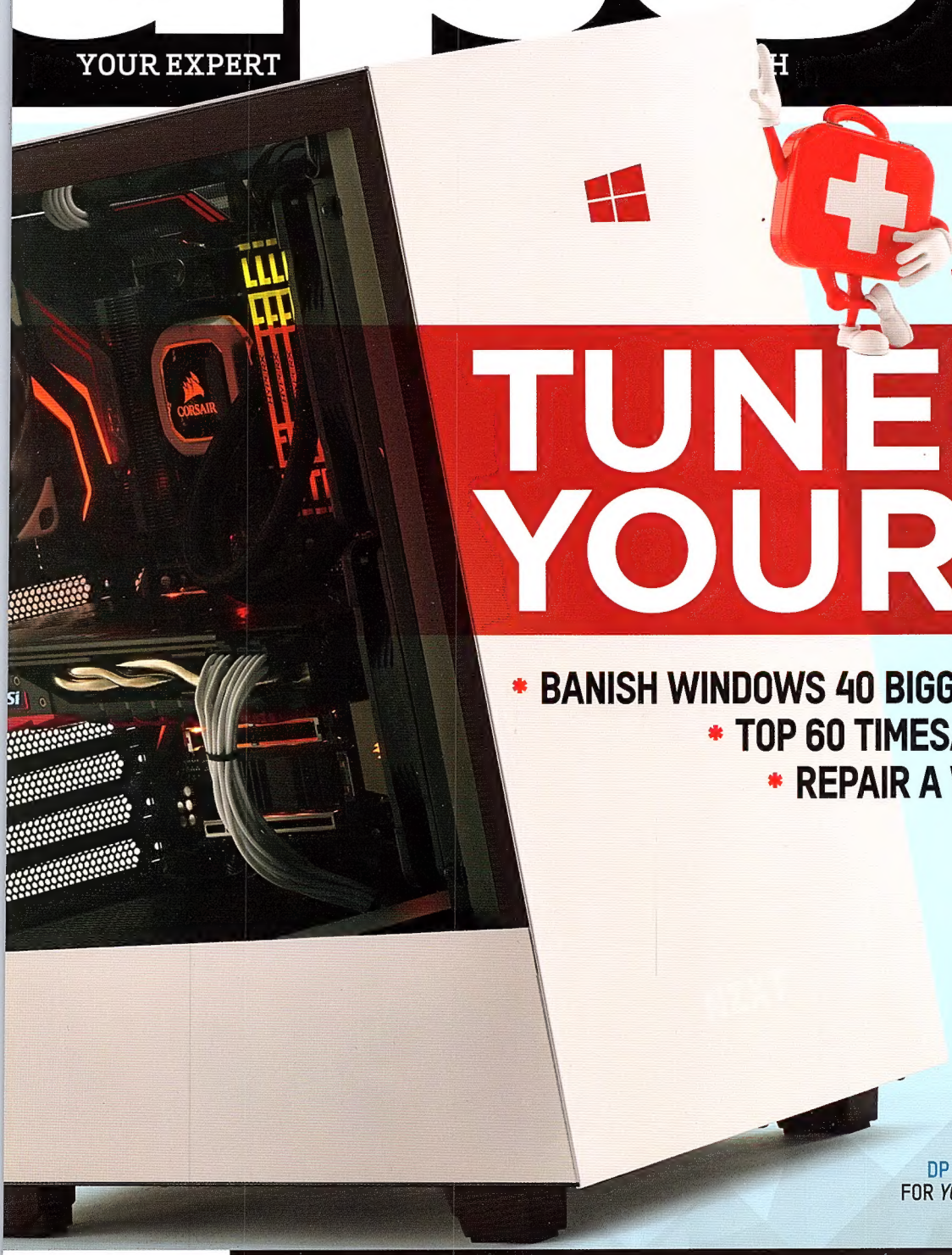

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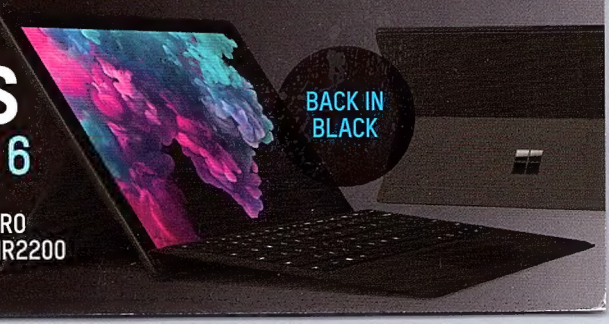

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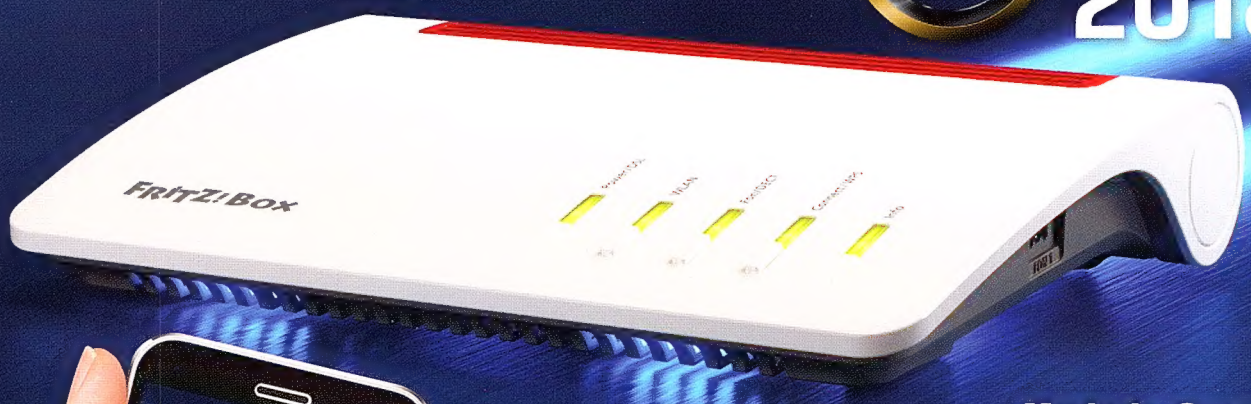

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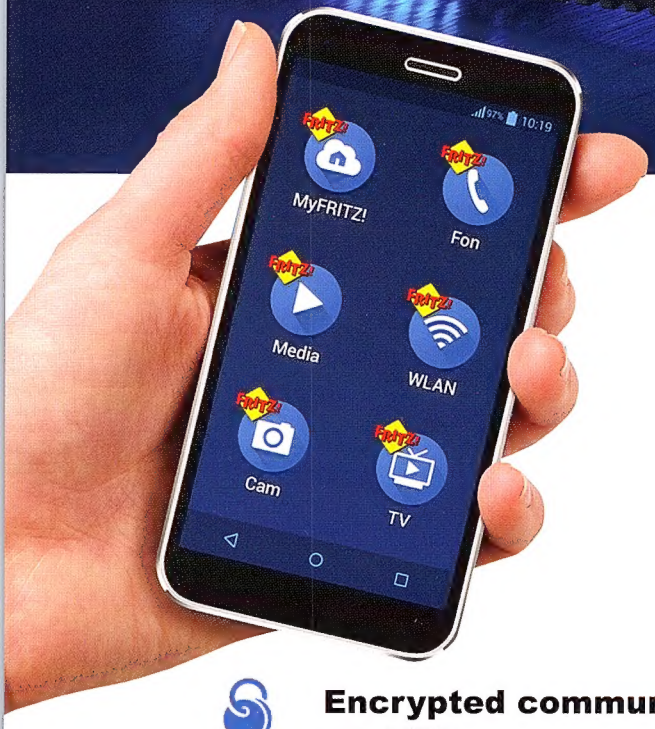

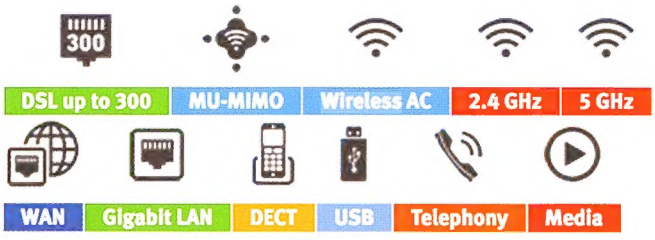

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Tuning up

This month in APC – the PC.

Despite the 'PC' in the '*APC*' title of this magazine, we're not focussed entirely on the home computer – especially in its stereotypical Windows format. But you know that already. Ever since issue one of *APC* we've covered not just the PC, but the things that revolve around the PC nexus. Today that includes thing like smartphones, the fabulous Raspberry Pi, and even machine learning tutorials from Darren Yates. There's a whole lot of Linux and Mac.

Yet despite this diversity we get the occasional email slamming us for covering Windows 10. Which is obviously remarkably odd and I certainly don't need to explain why this predominantly PC magazine devotes space to the latest version of the most common OS. But the emails come, and sometimes they're angry. Not at us, per se, but that anyone in their right mind would consider running Windows.

They usually come from people that put a $ in the spelling of Microsoft. You know the type. The pitch is often that Linux is free so why use Windows? That Microsoft just wants your money and everything it does is buggy and useless. That if you absolutely must run Windows, then XP was the last decent version.

It's a religious rage that even exceeds the boring Mac vs PC arguments. At least you'd get some semi-logic in those debates, though it seems to me that that age old parochial war has run its course and people mostly don't bother anymore, because, well, just let people do what they're happy with while you get on with what you like, and all is at peace in the world.

That said, there is a very valid point that sometimes gets raised and that's that we shouldn't all jump onboard with the latest version just because it's new and shiny. I understand that, and won't try and convince you otherwise.

But, for those of you that do run Windows 10 you know it's pretty stable and effortless. It is not, however, perfect. There are annoyances, there are things that we prefer done a certain different way, there is access to things that aren't as close to the surface as we'd like. So for you, this month (along with our usual Linux and Mac pages!) is a somewhat massive Windows tune-up and tweaking guide. Just the thing to chew up some Xmas holiday hours – perhaps just tinkering because tinkering is fun.

And maybe, if you were, for whatever reason, holding off from grabbing Windows 10, well, you hold in your hands the perfect guide to tailoring it perfectly for your needs!

Have a great month everyone! ■

BEN MANSILL
EDITOR
ben.mansill@futurenet.com

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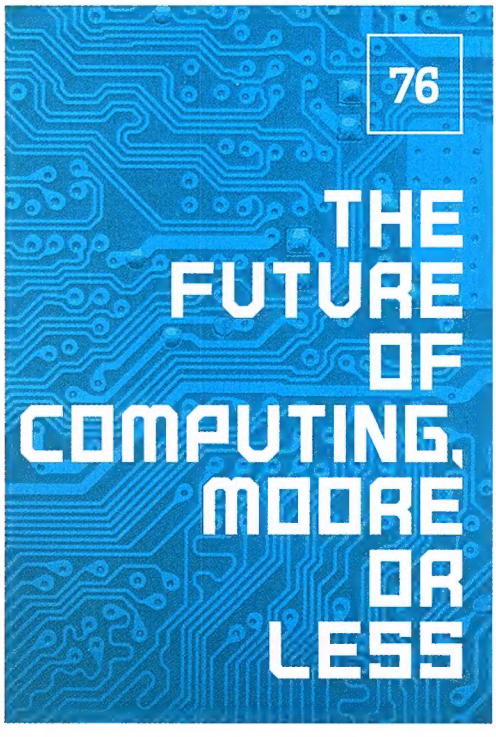

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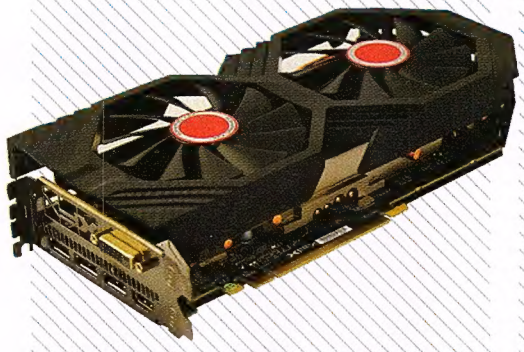

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Inside APC

Find out all about *APC*'s editorial policies, test practices, how to read the benchmark results, and more.

APC is Australia's oldest consumer technology magazine – having been consistently in print for over 35 years, since our first issue way back in May 1980 – and we take that heritage and responsibility very seriously. While our focus is obviously on the personal computer – it's in our name, after all – the very definition of the PC has changed and shifted markedly since the early 1980s. As such, we touch on many other areas of tech, too, from smartphones and apps to peripherals, accessories, online services and beyond. We have two main goals: to track down the best of modern tech and also to help our readers make the most of it.

We're also an open church in terms of platforms. We know most people aren't wed to a single brand's products and use a variety of devices. And, like you, *APC*'s journalists want to know what's good in tech – no matter what platform it resides on.

INDEPENDENT REVIEWS

Championing technology doesn't mean we're unrelenting yes-men and -women, however, and *APC* aims to be as objective as possible in all our coverage. That means identifying the best products from multiple perspectives – the best performance, best value and best features and, ideally, the products that offer the best mix of these three.

As a matter of policy, reviews published in *APC* are not shared with product-makers prior to print. We will contact vendors under certain conditions; for example, if we have a problem testing a product that seems to indicate it may be faulty, or to invite a vendor to clarify how a particular feature works. If an *APC* reviewer has any potential conflicts of interest involving a brand, the review will always be assigned to another writer.

LABS TESTING

Despite being a small magazine with limited resources, *APC* still strives to conduct the most rigorous, objective scientific tests and benchmarks we can so as to make our reviews as unbiased as possible. We use a variety of tools and programs for this, including many freely available benchmark suites for assessing media encoding, general system performance, gaming and battery life.

In most cases, for the benchmark results published in *APC*, you can assume that higher is better. There are certain tests that deviate from this rule where the opposite is true; in those cases, we've flagged the results with a note explaining as such.

We use both tables and graphs for displaying results; the latter are our preference due to their ease-of-readability, but tables are more compact, so we use these in cases where thoroughness is preferred.

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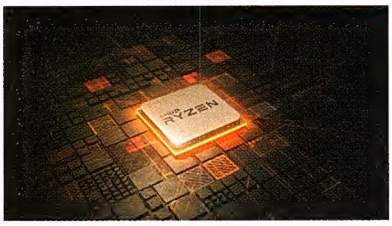


AMD no longer supporting mobile Ryzen drivers directly

NOW UP TO OEMS.

After complaints of a lack of driver updates for AMD's Ryzen mobile GPUs, the company took to Reddit to explain the situation. "We are committing to working with our OEMs to increase the release frequency of AMD Ryzen drivers", the company said, which effectively translates to the company handing over all responsibility to these manufacturers. **HD**

NSW introduces contactless payments on Sydney trains

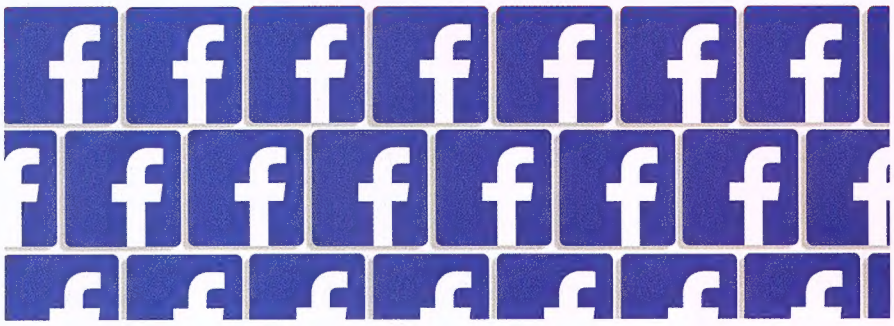
TAP ON AND OFF WITH YOUR CREDIT OR DEBIT CARD.

Transport for NSW had been trialling contactless payments on ferry and light rail services, but that has now been extended to Sydney Trains on the Opal network. Credit and debit cards capable of contactless payments – as well as smartphones, tablets and smart watches linked to their credit cards – can now be used on the train network instead of an Opal Card, with support for daily, weekly and Sunday fare caps included. **SS**

Microsoft building simplified 'Lite' OS to take on Chrome OS

LIGHTWEIGHT OPERATING SYSTEM COULD BREAK FROM TRADITION.

Early in 2018, we discovered that Microsoft was working on a lightweight version of Windows codenamed Polaris, intended to be optimised for tablets and 2-in-1s as well as desktop and laptops, but according to new rumours it will instead be called "Lite" and will apparently be truly lightweight, unlike Windows 10 S, and be capable of running off the upcoming Snapdragon 855 from Qualcomm. **HD**



UK Parliament has published hundreds of Facebook's internal company emails

Revealing anti-competitive practise and user data abuse.

Following a lawsuit against the social media giant, Facebook had some 250 pages worth of internal emails released to the public by the UK Parliament. The documents reveal previously unknown details around the company's internal behaviour, and seem to reinforce what many critics view as the social network's anti-competitive nature, alongside its abuse of user data and other troubling issues.

Within the emails are several examples of external companies begging Facebook not to remove user data permissions for their products – perhaps the most prominent victim of which is Twitter and its now-defunct Vine social video app.

By selectively "whitelisting" certain apps, the company was able to protect those apps that brought something to the Facebook platform – such as Airbnb and Netflix – while, it's argued, simultaneously blocking out any potential threats, such as the aforementioned Vine.

While that may not be seen as selling user data directly, revoking competitors' access to that data is one way in which Facebook could weaponise customer information for its own profit.

Another potentially concerning revelation from the papers has to do with Facebook's acquisition of the now-mammoth chat app, WhatsApp. The purchase was made in February of 2014 and cost the social media giant US$19 billion.

Facebook utilised a VPN and data analytics service called Onavo to chart the growth of WhatsApp, noticing that it was overtaking the likes of Tumblr and Vine and beginning to threaten Facebook's own Messenger services in terms of popularity.

Facebook purchased Onavo for US$100 million in 2013 – a year before its WhatsApp acquisition – a move which critics argue allowed the social media giant to track WhatsApp and other rising adversaries and nip them in the bud without any threat of competition.

In response to the public release of documents, Facebook is effectively claiming that 'it's not what it looks like', stating (perhaps fairly) that the documents were purposefully "cherrypicked" by the company behind the lawsuit, and don't accurately detail both sides of the story. **Harry Domanski**

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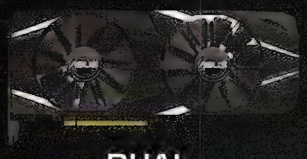

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Over the course of 2018, Bitcoin dropped in value by around 82%

AFTER ALMOST HITTING US$20,000.

After the phenomenal rise of Bitcoin in 2017, where it almost soared to the dizzying heights of a US$20,000 valuation, the cryptocurrency has taken a turn for the worse in 2018. Ever since the December, 2017 peak, Bitcoin has been steadily dropping and, in two weeks of November, lost 40% of its total value, hitting a low of US$3,520. **HD**

Telstra flies ahead with 5G plans

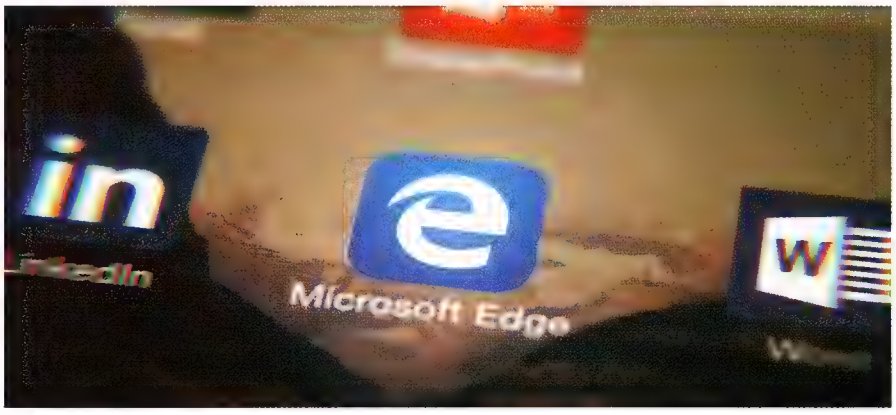
SHOWS OFF 5G SMARTPHONE PROTOTYPE AND VIDEO CALL.

Telstra's 5G rollout seems to be on course with the telco recently revealing a 5G ZTE smartphone prototype that it is testing on its network. The company is also testing an HTC 5G Hub, a mid-band commercial device connected to its 5G network. To make sure everything is running smoothly, Telstra has also demonstrated a 5G-to-5G video call – Australia's first – on a commercial network. Telstra expects the 5G smart hub to be available to customers in 2019. **SS**

Survey says Aussies are holding on to their phones longer

AND USING MORE DATA THAN EVER BEFORE.

The 2018 Deloitte Mobile Consumer Survey has revealed that almost a quarter of Australians are watching more video content on their phones, especially live TV. The survey also revealed that 39% of Aussies think they use their phones too much, while 26% feel they're able to limit their dependence on their devices. However, 34% say they're trying to use their smartphones less but aren't succeeding. The number of people with new phones (handsets that are less than 18 months old) has also dropped to 58%, down from 61% in 2016. **SS**



Microsoft is planning on replacing Edge with a new Chrome-based browser

A new default browser for Windows could be on the cards.

Not too long ago Microsoft began asking Windows 10 users why they prefer using Chrome as a browser over Edge. It seems we may have an idea why the company was doing so – Microsoft is washing its hands of Edge, according a report published by *The Verge*. Sources have told the online publication that it will be replaced by a Chromium-based browser which will become the default option on Windows 10. At the time of writing, this news was just hearsay, with the sources telling *The Verge* the announcement isn't too far away. With Chrome clearly the market leader when it comes to web browsers, the decision to switch to a Chromium-based option for better compatibility with Windows 10 is, perhaps, a wise choice, especially since Microsoft has struggled with Edge over the years. According to statistics shared by Netmarketshare, Edge's market share has been on a steady decline, currently pegged at barely more than 4%, despite Microsoft doing everything it can to give it a push. The decision to switch, however, is a brave move from the tech giant, especially since it can be construed as an admission of defeat. **Sharmishta Sarkar**

Google search results are personalised even when incognito, study finds

LOGGING OUT OF YOUR GOOGLE ACCOUNT WON'T HELP EITHER.

A study conducted by DuckDuckGo has found that Google's targeted search results are practically impossible to escape. The study suggests that this "filter bubble" remains active for each individual user, even when using private browsing (incognito mode) or when logged out of a Google account. As part of the experiment 87 participants searched for the terms "gun control", "vaccines" and "immigration" at the same time, only to find each individual had markedly different results despite the identical terms.

It was found that most participants had unique results, with first page results varying across the board as well. While some individuals shared a few common first page links, they weren't available to others. Even private browsing and being logged out "offered very little filter bubble protection". "These tactics simply do not provide the anonymity most people expect," claims DuckDuckGo. "In fact, it's simply not possible to use Google search and avoid its filter bubble." While the study is far from scientific and the results potentially biased, it does provide interesting insight. However, Google isn't taking the bait, saying the study is flawed. **Sharmishta Sarkar**

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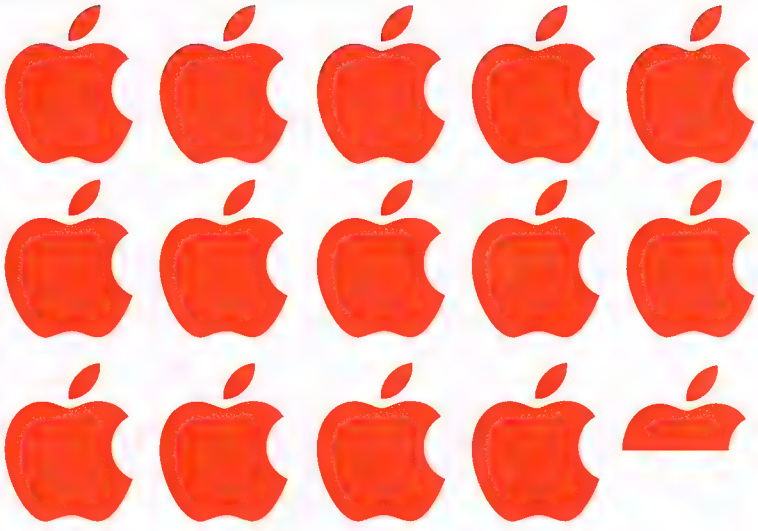
numbercrunch

» WE LOOK AT THE NUMBERS DRIVING THE BIG TECH NEWS



$14.4 BILLION

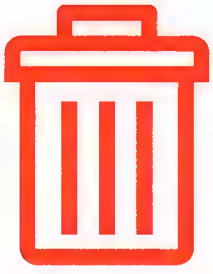
AMOUNT OF MONEY THAT APPLE HAS PAID TO THE IRISH GOVERNMENT IN BACK TAXES AND INTEREST.

Following an EU court case, The EU argued that a 'sweetheart' deal between the Irish government and Apple was illegal, and gave the iPhone maker an unfair competitive advantage.

16

NUMBER OF HYDROGEN-POWERED TRAINS THAT SHOULD BE RUNNING ON GERMANY'S NATIONAL RAIL NETWORK BY 2021.

The first two trains, made by Alstom, are already in service on the Cuxhaven-Buxtehude line in the north of the country. An electro-hybrid train, powered by batteries, is already in service near the capital, Berlin.



80,000

NUMBER OF TONS OF PLASTIC IN THE GREAT PACIFIC GARBAGE PATCH BEING TARGETED BY THE OCEAN CLEANUP PROJECT.

The aim is to use a high tech, U-shaped boom, dubbed the Ocean Cleanup System 001, to trawl for plastic as small as 1mm without harming local marine life. The Project's clean-up efforts are a veritable drop in the ocean, however. It's estimated that nine million tonnes of plastic end up in our oceans each year.

10 MILLION

NUMBER OF ELECTRIC CARS VOLKSWAGEN IS HOPING TO SELL IN THE FIRST WAVE OF ITS NEW MODULAR ELECTRIC DRIVE MATRIX (MEB) PLATFORM, WITH THE FIRST 150,000 SALES ACHIEVED BY 2020.

MEB will be available across all of VW's brands, which include Audi, Skoda and Seat as well as Volkswagen.

$3.4 BILLION

AMOUNT OF MONEY MADE BY THE US RECORDING INDUSTRY FROM STREAMING SERVICES SO FAR IN 2018 – 75 PERCENT OF THE TOTAL.

Digital downloads chalked up 12 percent, and physical media (including CDs and vinyl) accounted for ten percent. Most of the money made from streaming – according to the Recording Industry Association of America (RIAA) – came from subscription services including Amazon, Apple Music and Spotify. ■

techbrief

» SHARMISHTA SARKAR TAKES A DEEPER LOOK AT A TRENDING NEWS TOPIC.

Microsoft topples Apple as the most valuable tech company

Tech giant makes a surprising comeback.

Microsoft's products have revolutionised the way we work. Since the 1990s it was the leading tech firm, having revolutionised the PC with its Windows operating system. Not long after that Microsoft began to lose its lustre – yes, it was still profitable, but it was struggling to stay relevant.

That scenario, however, has taken a dramatic turn and, at the time of writing, Microsoft has deposed Apple to become the most valuable publicly trading company in the world. The last time Microsoft was on top was way back in 2002. Apple may have become the first trillion-dollar company in the world – a position it enjoyed briefly in 2018 – but it has, in the meantime, fallen far. With Satya Nadella at Microsoft's helm since 2014, the US company has been saved from becoming a has-been to taking on the world once again.

Microsoft Office has been a success for 25 years

The ubiquitous software nearly everyone uses.

2018 saw the Windows operating system turn 30, while the Office suite celebrated its 25th birthday. Even today, Microsoft Office remains the most popular productivity suite, with an estimated one billion machines currently running it. With the launch of Office 365 in 2011, Microsoft expanded the suite from the standard desktop applications into a cloud platform, integrating a variety of applications and becoming Microsoft's cash cow. The early version of Office was a clunky and pricey option, but has evolved into a highly integrated platform that runs not just on Windows but on OS X, iOS and Android.

Ballmer vs Nadella: transforming the culture at Microsoft

Does Microsoft's success make Satya Nadella CEO of the year?

When Satya Nadella took over from Steve Ballmer in 2014, Microsoft had been on a steady decline. Under Ballmer, each group under Microsoft's banner was battling each other for attention. Any innovative product was dismissed if it didn't support the Windows business. Nadella, however, diversified Microsoft's business into different verticals to ensure the entire company wouldn't suffer if one failed. He encouraged Microsoft staff to "achieve more" by giving them the freedom to make things people would enjoy using. He even embraced Linux support, which Ballmer once referred to as a "cancer" and "communism".

The Surface range succeeds where the Windows Phone failed

And Xbox gets its game on.

Microsoft began working on hybrid devices that birthed the current Surface range in 2009, with the first Surface device debuting in 2013. The Surface range today is genuinely impressive in performance and build. In the meantime, the Windows Phone died a premature death. Microsoft found it hard to develop both the software and the hardware for mobile and couldn't get it out fast enough. By the time the Windows Phone was ready, iOS and Android was already entrenched into customer psyche. Then there's the Xbox One consoles, with an estimated 30 to 50 million consoles sold. The Xbox One consoles may not be as popular as Sony's PlayStation or the Nintendo Switch, but Microsoft has seen an 8% growth in gaming revenue.

Innovation continues with Andromeda and the HoloLens

A new form factor could carry Microsoft into the future.

The first iteration of the HoloLens, Microsoft's AR glasses, are expensive, but they're built well with hologram resolutions that impress. While the HoloLens remains a developer product, the second generation AR glasses – codenamed Sydney – are being developed and rumoured to launch some time in 2019. This could create a push, leading to the growth of mixed reality devices. The tech giant's mythical Andromeda device – the pocketable dual-screen device – is also much talked about. If Microsoft can get both these devices right, hardware and software, it would usher in whole new era for the company.

Is Apple beginning to stagnate?

The Apple has fallen, but not too far.

Apple's reign at top spot was brief, but that doesn't mean the company is in any way doing badly. However, with the high cost of an Apple flagship, consumers are holding on to their iPhones for longer. This, juxtaposed with the slump in the overall mobile phone market globally, has seen Apple's revenue fall slightly. There's also been discussions around Apple's lack of innovation lately, which could see customer confidence waning. That said, Apple, along with Samsung, still rules the roost. Microsoft was never a match for the Cupertino firm in the mobile game, yet Bill Gates' baby came out on top. Steve Jobs would be turning in his grave. ■

gadgets

» GOOD GEAR

NORTH FOCALS

AR glasses that don't make you look like a glasshole.

US$999 | SHOP.BYNORTH.COM

AR smart glasses have been an important piece of emerging tech since Microsoft introduced the Hololens, but the computing power and bulky technological constraints have meant that they never made it into the mainstream tech market. The recently released Focals by North (formerly Thalmic Labs) might just be sleek enough to change this. These chic spectacles will give you the time, weather, text messages, calendar events, third party notifications and turn-by-turn directions by connecting, via Bluetooth, to your phone. The device hasn't integrated any eye tracking controls so you'll have to wear the Loop ring wearable ring controller to interact with digital content, but you can also talk to it using Alexa.

DJI OSMO POCKET

A stabilised 4K video camera in your pocket.

$599 | WWW.DJI.COM

DJI have made a lot of clever breakthroughs in the drone space over the years and the company is looking to bring some of that innovation to its less-lofty camera products. Osmo Pocket is the latest handheld gimbal-camera from DJI and it's not short on advanced filming tech. While the Osmo range has traditionally been pitched at semi-professional content creators, Osmo Pocket is far more affordable and compact than its predecessors. In addition to providing superior stability, the Osmo Pocket is also able to track faces or selected objects and automatically pan and tilt to automatically keep them perfectly framed at the centre of the screen.

SONY PLAYSTATION CLASSIC

Everything old is new again.

$150 | WWW.PLAYSTATION.COM

Following in Nintendo's success in releasing miniaturised versions of its NES and SNES consoles in the last couple of years, Sony has joined the throwback bandwagon with its own miniaturised PlayStation. The PlayStation Classic is 45% smaller than the original and is fitted with modern processors and a HDMI output, so it can play nice with today's televisions. The PS Classic stores all of its 20 games locally and while there's a lot to like, there are also some glaring omissions like *Tony Hawk's: Pro Skater 2*, *Crash Bandicoot* or any of the 90s *FIFA* titles, to name a few.

SONY WF-SP900

Sony are swimming in true wireless earbuds.

$499.95 | WWW.SONY.COM.AU

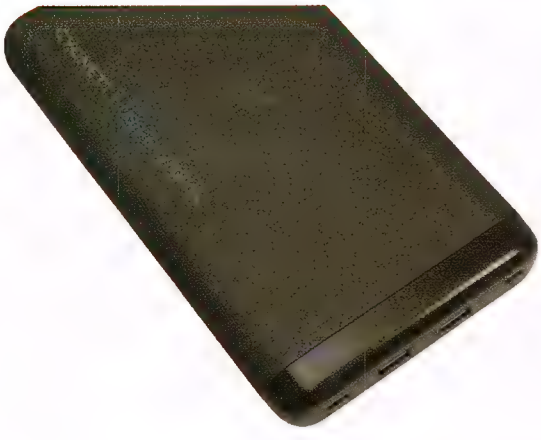
There's been a lot of development in the true wireless earbud space this year with considerable advancements in both noise cancelling and Bluetooth 5, but Sony's swimproof WF-SP900s are, by far, the most unique true-wireless buds we've seen. Sony has sealed these buds in an IP68 rated enclosure that has been tested in salt and fresh water at a depth of two meters for 30 minutes in order to let you swim in them. Bluetooth is notoriously bad at transmitting through a water barrier so Sony has built-in 4GB of storage to play your favourite playlist directly from the headphones. These perks aren't cheap, but for anyone needing a pair of headphones for laps these will be hard to beat.

SHARKBANZ 2

This wearable might save your life.

$119 | WWW.SHARKBANZ.COM.AU

While there's little conclusive evidence on the topic, we do know that sharks are sensitive to electromagnetic fields and that they use this sense to navigate and feed. There are a couple of companies using intense magnetic fields to deter sharks, but Sharkbanz is one of the first to scientifically test the efficacy of its products. In June 2018 the company released a paper that used 15 frenzied bull sharks to see if they would attack a fake limb wearing a Sharkbanz 2. Although there were many approaches none of the sharks actually bit the Sharkbanz limb in the 54 minute trial, even when it was baited.



CYGNETT CHARGEUP PRO

Massive power, impressive safety.

$149 | WWW.CYGNETT.COM

Do you know those signs at airports, about how you should check your power banks with airport staff? Yeah, we ignore them too, but if you're a bit more conscientious about keeping your devices both charged and safe, this power bank is an essential part of your travel kit. It is airline-approved, and packs a massive 27,000mAh – enough to charge a 12-inch MacBook Pro for 16 hours. On top of that it features two USB-C ports, and a single USB type-A port, so you can charge multiple devices. It's also protected against over-current, over-voltage, short-circuiting, and high temperatures. It's heavy, but it's very good. ■

howit'sdone

SPEAK UP
This larger speaker is 50 per cent louder than the previous model and uses a silicone gasket to keep the water out.

CASING
The casing has been redesigned to be thinner and more accessible, so your new Watch is easier to repair if it breaks.

DIGITAL CROWN
This dial now clicks slightly as you turn it for improved feedback, and you touch it to use the ECG system.

DISPLAY
This OLED display extends close to the edge of the glass, and the deep blacks blend right into the background.

BATTERY
The battery in the new Watch is actually smaller than the old one, but it still manages around 18 hours between charges.

HEART SENSORS
The back panel contains the wireless charging ring, as well as the electric ring that touches your wrist to enable ECG measurements.

MOTHERBOARD
This single board holds almost all the Watch's 'brains'. The S4 chip is twice as fast as the Apple Watch Series 3.

PADDING
This plate sits inside the back case and absorbs heat from the motherboard to stop it reaching your wrist.

TAPTIC ENGINE
This little box uses magnets to create the feeling that the Watch is tapping you on your wrist when you get a notification.

Inside the new Apple Watch

We take a look under the glass of the thinner, more powerful Apple Watch Series 4.

It's Summer, and that means three things: your warm socks are being replaced by thongs, the leaves are starting to turn green, and Apple has just released some new technology.

This year we have an all-new Apple Watch, featuring a larger screen, a thinner design and some smart new health features that are sure to help save lives. When it's on someone's wrist, it looks so similar to the previous Apple Watches that you may not even give it a second look. But underneath all that glass is some impressive new tech.

First, it's got a faster, more efficient chip, which has meant Apple could make it slimmer without reducing the battery life. On the back of the watch you'll find the optical heart-rate sensor that was in previous models, along with a new electrical ring. Paired with the metal in the digital crown (the dial on the side of the watch), this forms a simple electrocardiogram, or ECG machine. It can record your heart beat and tell you whether you have cardiac problems, so you can send the report to your doctor. That's really smart – although unfortunately the feature is only approved for use in the US so far, with global roll-outs still a way off.

On the front of the watch you'll find a new, 30 per cent larger display. It's thinner and extends right to the edge of the watch, curving at the corners. Just like before, it's waterproof down to depths of 50 metres and tracks workouts, activity and more. ■

epinions

AMD
RED TEAM
IS RECRUITING
"I have built more than 20 computers for personal use, running the gauntlet of pretty much every AMD chip release"

RED TO THE CORE

As a long time reader I felt prompted to share my PC experiences.

My first AMD chip was the AMD 486 DX/66, because I wanted more than the Intel 386DX/25 could offer, and the last Intel I ever owned was a Pentium 200! Since then I have built more than 20 computers for personal use, running the gauntlet of pretty much every AMD chip release.

My previous favourite was an FX6300 which ran an OC of 4.6GHz for over two years before I retired it for a Ryzen 1800X OC to 4.1GHz,16GB of 3200MHz RAM, 500GB Samsung 960 Evo, 1TB Crucial MX500 SSD, 500GB WD Raptor, Gigabyte GTX1060 6GB G1 Gaming, Corsair 240mm, Pioneer Blu-ray DVD, Win 10 Pro, 27 inch Samsung curved monitor etc etc.

Never once have I ever felt underpowered or that I was missing out because I didn't have an Intel CPU. (more than happy with the benchmark results!). As well, I have run a small one man show computer business in a country town, and have built more than 300 custom computer systems in the last 15 years or so. These have ranged from Mum and Dad home systems to small business systems, up to custom gaming rigs. Of these around 90% have been AMD chip based, I have had no trouble convincing clients to go 'Red' – even the gaming rigs have all been AMD, except for one when the client insisted on an Intel. In all that time I have never had a client say they were unhappy with their system, in fact they usually comment on how quick their computer is.

All it takes is the effort to tailor the system specs to the individual user, "bang for buck" as it were. Anyway, I suppose you now realise that I have red blood running through my veins!

Steve Sharples

Ben Mansill replies: *Good on you Steve. While we here at APC would never let ourselves be anything less than perfectly balanced and impartial, it's cheering to see you sticking with what you know works well. Reading this takes me back to my first PC – the very 386DX/25 you mentioned. I've also built Athlon and Duron boxes over the years. Could be time for a Ryzen next!*

END OF THE GAMING PC?

I've been testing Google's Project Stream, which is to play Odyssey in the Chrome browser strictly over the Internet. The quality is pretty awesome. I'm sure Google will eventually expand this concept, and I've heard that Xbox will have a streaming console as well. Do you think eventually this service will make the PC irrelevant for gaming?

Tian

APC replies: *While streaming services certainly do have their place, there will always be people who want to have total control over their entire gaming experience. We can't see the likes of Project Stream replacing that anytime soon.*

APCMAG@FUTURENET.COM

Come on, have your say!

We want to hear what you think. Add to these discussions or email your views (in fewer than 250 words) to **apcmag@futurenet.com**. All correspondence becomes the property of *APC* and is subject to editing. Letters must include full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

enduser

» SHAUN PRESCOTT DIGS INTO THE BIG TECH ISSUES.

Australian government passes world-first encrypted messages bill

You may be being watched, but you'll never know, writes Shaun Prescott.

Last month, Australia became the first country in the world to legislate the requirement for tech companies to provide backdoor access to encrypted messages. More specifically, the law will allow police and intelligence agencies to selectively target users – presumably suspects of crime – via encryption backdoors. Police have long called upon technology companies trading in encrypted communication to help with access, but now, in Australia, they must.

As an example: if Australian police or intelligence wants to access Joe Blogs' messaging history on Facebook, Facebook will be required, under Australian law, to either help the police access these messages, or else, hinder the encryption in order for the police to more readily access what they need.

Despite months and years of lip service, Bill Shorten's Labor party allowed the Coalition's bill to pass with no changes. Lawyers, and advocates for privacy and internet freedom are naturally unnerved; not only does it signal an unprecedented amount of state access to internet communication services, but it's also abundantly obvious that no Australian politician really understands what encryption is.

"The laws of mathematics are very commendable," former prime minister Malcolm Turnbull said last year, "but the only laws that apply in Australia is the law of Australia."

As always, the looming, ever-present threat of terrorists was the stated motive for passing this bill. What Turnbull and undoubtedly Morrison – not to mention more qualified politicians – don't seem to understand, is that one does not simply burrow a hole through encryption. During a senate hearing last month, Francis Galbally, a chairman of encryption company Senetas, explained that making changes to one aspect of a telecommunication service's encryption can have a dire ripple effect. "The bill, should it become law, will profoundly undermine the reputations of Australian software developers and hardware manufacturers in international markets," he said.

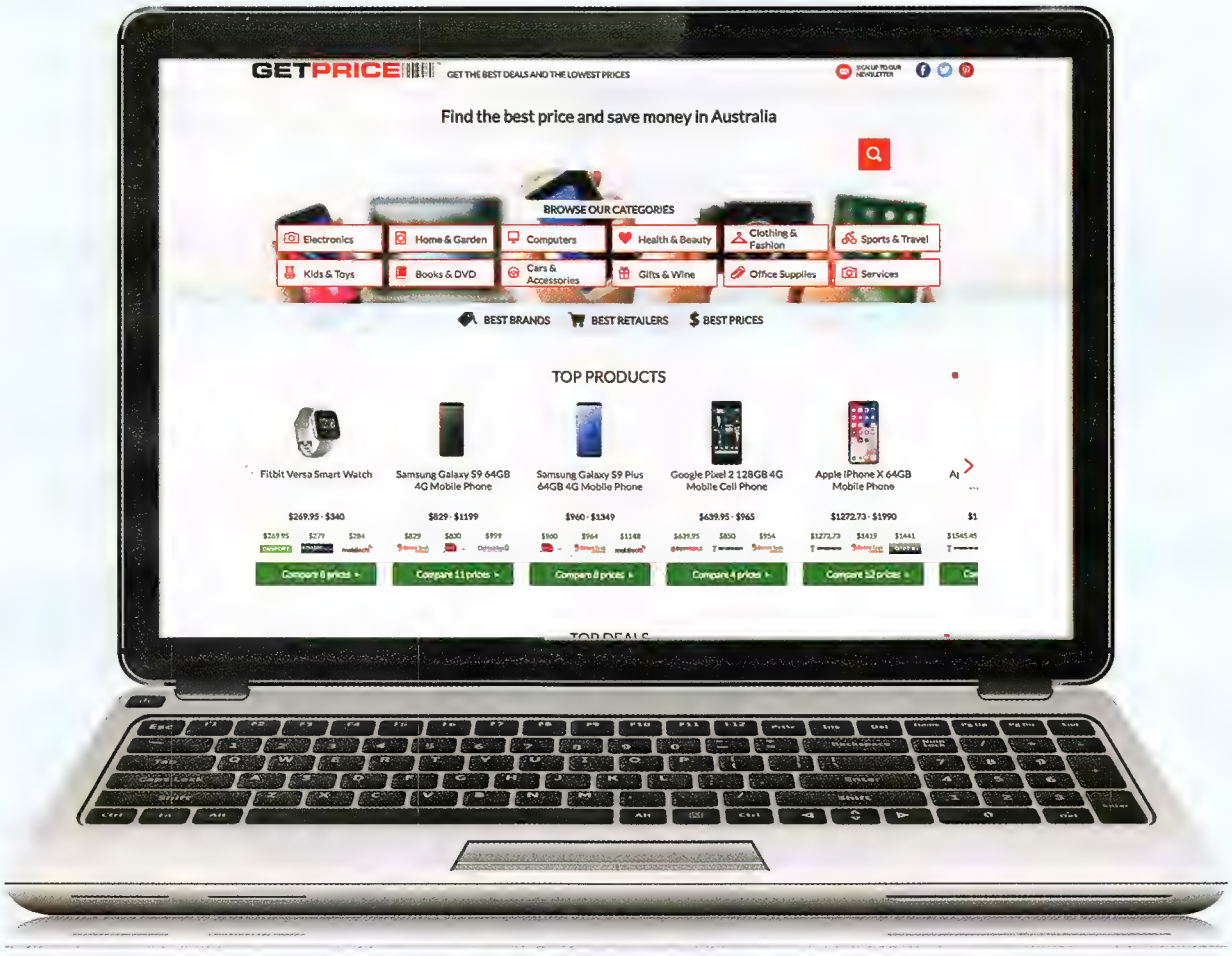
But it's the thought that counts, right? And anyway, what does it all mean for us lowly citizens? Well, from moment-to-moment, not much. If the police decide they want to access our messages we won't know if they've done so. For that matter, if police or intelligence decides it wants to access a politician's messages, they won't know either. There's the potential for security as a whole to be reduced, as designed weaknesses built especially for one person, might fall prey to hackers or terrorists. In an age when a hacked Twitter account message can lead to a stock market crash, it's not very reassuring.

As for companies like WhatsApp, Facebook, Signal, and more – if they want to continue operating in Australia they'll need to comply. And more than likely, they will. But Australia isn't a huge priority market in the global scheme of things, so it's very possible that future apps and services will just avoid the region altogether. ■

END USER

Share your stories!

If you have an interesting story about technology users, their experiences and the issues that affect us all (whether funny or serious), email us at **apcmag@futurenet.com**. All correspondence becomes the property of *APC* and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.



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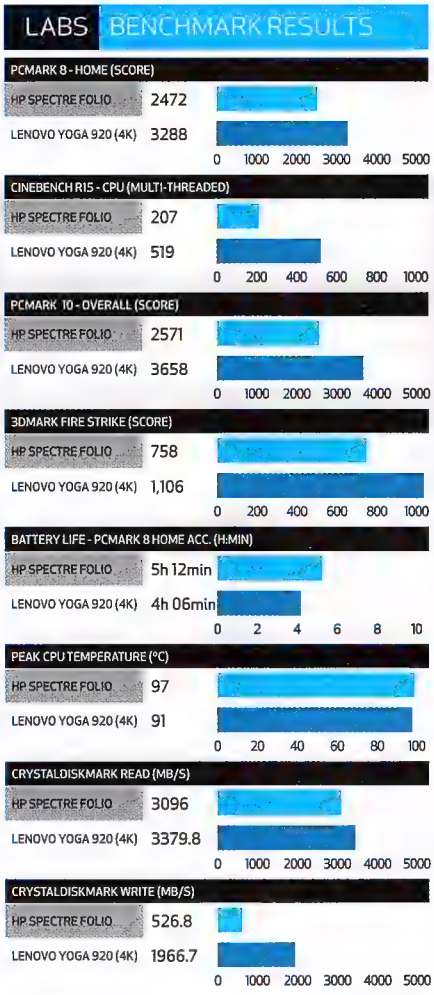
LABS BENCHMARK RESULTS
PCMARK 8 - HOME (SCORE)
HP SPECTRE FOLIO 2472
LENOVO YOGA 920 (4K) 3288
0 1000 2000 3000 4000 5000
CINEBENCH R15 - CPU (MULTI-THREADED)
HP SPECTRE FOLIO 207
LENOVO YOGA 920 (4K) 519
0 200 400 600 800 1000
PCMARK 10 - OVERALL (SCORE)
HP SPECTRE FOLIO 2571
LENOVO YOGA 920 (4K) 3658
0 1000 2000 3000 4000 5000
3DMARK FIRE STRIKE (SCORE)
HP SPECTRE FOLIO 758
LENOVO YOGA 920 (4K) 1,106
0 200 400 600 800 1000
BATTERY LIFE - PCMARK 8 HOME ACC. (H:MIN)
HP SPECTRE FOLIO 5h 12min
LENOVO YOGA 920 (4K) 4h 06min
0 2 4 6 8 10
PEAK CPU TEMPERATURE (°C)
HP SPECTRE FOLIO 97
LENOVO YOGA 920 (4K) 91
0 20 40 60 80 100
CRYSTALDISKMARK READ (MB/S)
HP SPECTRE FOLIO 3096
LENOVO YOGA 920 (4K) 3379.8
0 1000 2000 3000 4000 5000
CRYSTALDISKMARK WRITE (MB/S)
HP SPECTRE FOLIO 526.8
LENOVO YOGA 920 (4K) 1966.7
0 1000 2000 3000 4000 5000

HP Spectre Folio

Has HP minced its latest convertible, or is everyone going to lap up this leatherbound laptop?

Without leather it would be impossible to tell a really important book from the latest Mills and Boon, we wouldn't have anywhere to store our money, we couldn't hold up our trousers, we wouldn't have chapps and if HP had its way, we wouldn't have laptops either. So integral is the leather folio to the professional convertible that HP have chosen to literally glue beef-skin to its latest 2-in-1. And while this may mean HP's latest device has to endure being called names like the MeatBook, gluing your folio case to the laptop isn't always as bad as it seems.

The Spectre Folio's 13.3-inch touchscreen display has a magnetically mounted pivot point in the middle of its back that allows you to use it as a traditional laptop with a hinge, or flip it into a tablet. For most use cases this is a great convertible solution and there's a lockable display plus trackpad position that we could see getting a lot of use.

The Spectre Folio is the first device we've tested with an eighth gen Y-series CPU, which were announced back in August of 2018. The hyper-efficient dual-core Core i7-8500Y CPU in the Spectre Folio is the fastest Amber Lake CPU available, but it's also passively cooled – a feature we imagine to be essential for a PC that is wrapped in tanned thermal blankets. The vast majority of today's premium 2-in-1s use U processors which have transitioned to 4 cores over the last year, so pretty much any other 2018 convertible will offer roughly double the raw compute power of the Spectre Folio. This device does punch above its weight in general home and work tasks by boosting to a speedy 4.1GHz over short periods, but it scores 45% less than a Lenovo Yoga 920 with a quad core i7-8550U CPU in Geekbench multi-core CPU tests. So it's a little underpowered.

This chip also takes a hit in the graphics department with the Intel UHD Graphics 615 scoring between 45 and 60% lower on 3DMark's Time Spy when compared against similar 2-in-1s with Intel HD 620 GPUs. Then again, anyone after a leatherbound laptop probably won't be too disappointed that it's not capable of even the lightest video gaming.

The HP Spectre Folio is definitely priced as a premium device, starting at $2,799 for a Core i5-8200Y CPU, 8GB of RAM and a 256GB PCIe SSD. The model tested here has a Core i7-8500Y, 16GB of RAM and a 512GB SSD, landing at a painful $3,399, but you can go all the way up to a 1TB SSD if you have $3,799 to splash about.

The screen is a dull when sitting next to an ultrabook competitor like the Huawei MateBook X Pro – we expect this has something to do with the screen's thermal constraints when wearing leather – but it's also only FullHD, which is unusual for any convertible that costs this much. The ultra efficient CPU and dull screen combine to give a particularly long battery life when watching movies (HP claims up to 19 hours with a conservative screen brightness), but put it under any load (say PCMark 8's Home accelerated battery benchmark) and battery life drops back to 5 hours and 12 minutes. ■ **Joel Burgess**

Verdict

If you want a raw deal on power, performance and price, then the Spectre Folio is the laptop for you.

★★★☆☆

LABS BENCHMARK RESULTS

PCMARK 8 - HOME (SCORE)
HUAWEI MATEBOOK X PRO 3448
MICROSOFT SURFACE LAPTOP 2 2703
0 1000 2000 3000 4000 5000
CINEBENCH R15 - CPU (MULTI-THREADED)
HUAWEI MATEBOOK X PRO 518
MICROSOFT SURFACE LAPTOP 2 581
0 200 400 600 800 1000
PCMARK 10 - EXPRESS (SCORE)
HUAWEI MATEBOOK X PRO 3,940
MICROSOFT SURFACE LAPTOP 2 3,263
0 1000 2000 3000 4000 5000
3DMARK FIRE STRIKE (SCORE)
HUAWEI MATEBOOK X PRO 2,595
MICROSOFT SURFACE LAPTOP 2 1,153
0 1000 2000 3000 4000 5000
BATTERY LIFE - 1080P VIDEO PLAYBACK (H:MIN)
HUAWEI MATEBOOK X PRO 7h23min
MICROSOFT SURFACE LAPTOP 2 8h08min
0 2 4 6 8 10
PEAK CPU TEMPERATURE (°C)
HUAWEI MATEBOOK X PRO 98
MICROSOFT SURFACE LAPTOP 2 73
0 20 40 60 80 100
CRYSTALDISKMARK READ (MB/S)
HUAWEI MATEBOOK X PRO 3298.9
MICROSOFT SURFACE LAPTOP 2 1643.8
0 1000 2000 3000 4000 5000
CRYSTALDISKMARK WRITE (MB/S)
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MICROSOFT SURFACE LAPTOP 2 811.7
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Huawei MateBook X Pro

How does Huawei's premium ultrabook compare now that it's finally available Down Under.

In many ways the MateBook X Pro is a pastiche of great ideas pioneered by other ultrabook manufacturers. Initially it looks a lot like a Macbook Air with its slim rounded chassis, rubber dome feet and cutaway edge tabs for ventilation. It's also borrowed elements form the Macbook Pro's style guide including keyboard-surround speaker grills, a generous 16 x 9 style trackpad and a simple black and white key-colouring scheme. It's even taken inspiration from Microsoft using the Surface's 3:2 aspect ratio, with the MateBook X Pro's 13.9-inch 3000x2000 touchscreen display.

In this instance it really does seem like Huawei has taken the best bits from existing laptop design and stitched them all together. There's also enough custom Huawei tech in the device to make it feel unique. Most notable is Huawei's removal of the camera from the top of the screen to a popup key on the centre of the keyboard. This gave Huawei the freedom to shrink the bezels to a size never seen before, giving the device the highest overall screen-to-body ratio of an ultrabook at 91%.

The MateBook X Pro can be configured with either an Intel Core i5-8250U or a Core i7-8550U. The entry-level model is paired with 8GB of RAM and a 256GB SSD to land at $1,899, while the i7 version bumps up the RAM to 16GB, has a bigger 512GB SSD and throws in a dedicated Nvidia MX150 GPU for an RRP of $2,599. Huawei is selling the new devices through the Microsoft Store in Australia, putting them right next to the Surface Laptop 2s, which cost $100 and $600 more for the same-specced i5 and i7 models, respectively.

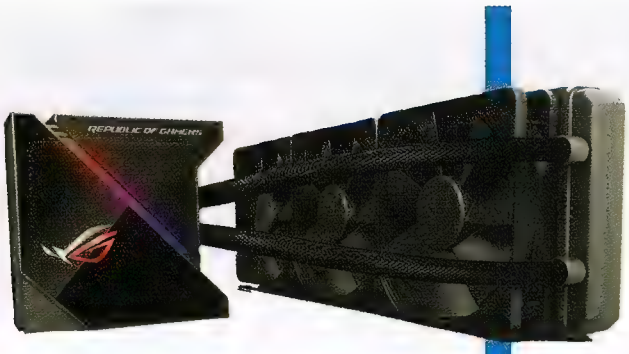
While the Core i5 configuration will be more than enough grunt for anyone looking to just use Word, Excel and web browsers, the Core i7's dedicated Nvidia MX 150 will add the capacity for basic graphical rendering and even some light gaming. You'll struggle with any intensive games, but titles like *Rocket League* and *Overwatch* run at 50% higher frame rates than you get with the i7's integrated GPU. The Core i7-8550U model we tested is a pretty standard laptop chip for premium ultrabooks, and it performed as expected in both raw Cinebench R15 CPU benchmarks and HWBot's x265 media encoding tests. This translated into above average PCMark 8 Home accelerated scores that were about 5% better than a similarly specced Dell XPS 13, a Lenovo Yoga 920 and a Razer Blade Stealth.

The overall design of the Space Grey model is somewhat tainted by a cheap looking powdered metal chassis with reflective bevelling. The MateBook X Pro can also run really hot if you're herding a bunch of Chrome tabs, but when you consider it's got a 56Wh battery that lasts 7 hours and 17 minutes during 1080p video playback, and a fast Gen 3 PCIe SSD, the drawbacks are far outweighed by the benefits on offer. ■

Joel Burgess

Verdict

A well-constructed professional ultrabook that has a big screen and doesn't cost too much.



COOLING

$399 | WWW.ASUS.COM.AU

Asus ROG Ryujin 360 AIO Liquid Cooler

AIO cooling at an entirely new price point.

The Ryuo is already a seriously high-end piece of kit, but the Ryujin 360 takes it up another notch. It's got more cooling capacity, improved fans and a bolder pump/head design that packs in an additional fan.

The Ryujin comes with the same 1.77 inch OLED screen found on the Ryuo, but it also comes with a plastic shroud that covers the entire head and mounting assembly. Inside there's an additional fan that's designed to cool the motherboard VRM, RAM modules or an adjacent M.2 drive. You get addressable RGB lighting too.

The Ryujin 360 includes three Noctua NF-F12 series fans. These fans are contenders for the best PC fans on the market. They are renowned for their excellent performance, airflow characteristics and low noise. These fans cost over $30 each which significantly contributes to the Ryujin's high price.

The Ryujin 360 performs very well, but it doesn't exactly blow away cheaper dual 120mm radiator coolers. We only saw a three degree difference in overclocked 8700K load temperatures vs the Ryuo 240. Yes it looks great and is packed with top quality components, but at $399(!) you're into custom loop territory.

The gorgeous and fully customizable Ryujin 360 does an excellent job, but it's shown up by its cheaper and only slightly less effective little brother, the Ruyo 240. The Ryujin doesn't do enough to justify its cost.

Chris Szewczyk

Verdict

The gorgeous and highly capable Ryujin 360 ticks all the boxes, but struggles to justify its price.

★★★☆☆

COOLING

$249 | WWW.ASUS.COM.AU

Asus ROG Ryuo 240 AIO Liquid Cooler

AIO cooling that demands to be seen and not heard.

Asus' ROG brand might be best associated with motherboards and graphics cards, but that's changing as the company branches out into other areas. We saw the Asus Ryuo and Ryujin CPU coolers on display at Computex and we've been itching to get our hands on them ever since.

The key differentiating feature of the Ryuo 240 is the 1.77 inch OLED display placed atop the block. It's fully customizable and allows you to show off your own animations or pictures, or it can show real time monitoring information. The LiveDash control software is easy to use too. There's a splash of RGB lighting around the aluminium shrouded block. It really looks amazing and it demands to be shown off in a tempered glass case. If PC aesthetics are important to you, the Ryuo (and big brother Ryujin) are about as good as it gets outside of fully customized solutions.

The Ryuo isn't all about bling. It kept our 5GHz all core i7-8700K cool and did so without having to resort to unacceptable noise levels. Under normal loads it is effectively silent. It compares well to its big brother and a similar spec Corsair H100i Pro. The Corsair is cheaper, but doesn't have the OLED screen of course.

The Asus Ryuo 240 is an eye catching and unique AIO cooler. You can get similar cooling performance for a lot cheaper elsewhere, but no other AIO cooler can match the unique aesthetic that the Ryuo offers.

Chris Szewczyk

Verdict

A pricey but truly unique, yet still very capable AIO cooler that demands to be shown off.

★★★★★

apc HOT PRODUCT

PHONE

$1,599 | WWW.HUAWEI.COM

Huawei Mate 20 Pro

Huawei throws down the gauntlet with its best phone to date.

The Huawei Mate 20 Pro is the supercharged version of the 'standard' Huawei Mate 20, and while its specs are similar to its less expensive counterpart, with both handsets boasting Huawei's latest Kirin 980 7nm processor, 128GB of onboard storage and 6GB of RAM, the Huawei Mate 20 Pro is able to justify its higher cost with several impressive additional high-end inclusions.

Sporting a number of futuristic features (including one world-first) and a more premium price point than we're used to seeing from the Chinese manufacturer, the Mate 20 Pro is clearly Huawei's play for the 'best smartphone in the world' crown – and for once, the company is very much within reach, offering a handset we think belongs in the same league as the iPhone XS Max and Samsung Galaxy Note 9.

With its curved glass display and coloured aluminium frame, it's very easy to mistake the Huawei Mate 20 Pro for a Samsung Galaxy S9 Plus at first glance. Look closer, and you'll start to notice Huawei's signature styling and other, more subtle differences.

Yes, it's got a notch in its beautiful QHD+ display, but it's for the inclusion of a second sensor to allow for 3D facial recognition functionality, which is said to provide more security than the standard Mate 20's image-based facial unlock. Although our tests have shown the Mate 20 Pro's 3D face unlock to be exceptionally fast (way speedier than Apple and Samsung's equivalent implementations), the Pro also offers an in-display fingerprint scanner that you can use instead.

Of course, being a Huawei phone, it's photographic capability is also off the charts. Once again sporting Leica branding, the Mate 20 Pro has ditched the monochrome sensor this year, instead opting for a primary 40MP sensor that handles both RGB and monochrome modes.

With this ultra-wide sensor and Huawei's 3X fixed and 5X hybrid zoom, you can not only close in on any subject (macro photography allows for photos from just 2.5cm away), but also pull out to get a much wider view, making the Mate 20 Pro the most versatile camera we've yet seen on a flagship smartphone.

An all-round solid performer, the Mate 20 Pro handled itself especially well in its Geekbench 4 benchmark, earning a single/multi-core score of 3,294/9,789 – this puts it up there with Samsung's Galaxy Note 9, which scored 3,734/9,056.

On the battery side, while Google's Pixel 3 handsets have only just received wireless charging functionality, Huawei has taken things a step further with the inclusion of reverse wireless charging – and yes, you read that correctly. Compatible with any phone that boasts Qi functionality, the Huawei Mate 20 Pro is actually able to wirelessly charge another device when you place the two back-to-back. And, given that it has an enormous 4,200mAh battery (the largest in any flagship to date) that provides just under 10 hours of life with intense usage, chances are you'll have plenty of juice to spare. ■

Stephen Lambrechts

Verdict

Easily the most advanced phone that Huawei has produced to date, the Mate 20 Pro is premium in every sense of the word.

2-IN-1

$1,349 | WWW.MICROSOFT.COM

apc RECOMMENDS

Microsoft Surface Pro 6

The best one yet, but only just.

Before Microsoft introduced the Surface Pro (2017) last year, the company explicitly said that there was no such thing as a 'Surface Pro 5.' Why? Essentially, a future Surface Pro would get a number again when it brought "an experiential change that makes a huge difference in product line."

Now, Microsoft has leapfrogged the '5' moniker entirely in launching the Surface Pro 6. By that logic, you wouldn't be out of line to expect a massive sea change – or at least one or two of the changes that have been requested for years.

While the Surface Pro 6 is inarguably the most powerful and longest-lasting (when it comes to battery life) Surface tablet yet, we have a hard time accepting that it's worthy of the number. Aside from those marked improvements in performance, and a shiny new colour scheme, nothing else about the Surface Pro has changed year over year... not even the USB 3.0 port. So, where does that leave prospective buyers?

PRICE AND AVAILABILITY

The starting price for Microsoft's Surface Pro 6 comes in at $1,349, which is directly in line with pricing for the Surface Pro 2017. The tablet is available for purchase right now in Australia.

The version you see configured here would cost you a cool $1,849 on account of the upgraded storage from 128GB on the base model to 256GB. That's quite a price hike for another 128GB.

From there, the tablet can be configured with an Intel Core i7 processor, up to 16GB of memory and as much as 1TB of SSD space. If you want the most souped-up version of this tablet, that'll cost you a whopping $3,459.

Remember, as with previous Surface Pro devices, none of these prices include the $139 Surface Pen, nor the $149 Type Cover.

Comparatively, the 12.9-inch iPad Pro costs $1,529, which gets you a 2732x2048-pixel display powered by Apple's A12X processor and with 64GB of flash storage. However, that too doesn't include a keyboard or stylus, which call for another $145 and $299, respectively.

On paper, the Surface Pro 6 remains better value. However, it's a closer race than it's ever been.

Then, there's the brand-new Pixel Slate, which Google wants US$599 for to start with, which is excellent in comparison. However, the company wants another US$199 for its keyboard cover accessory, which is not so excellent, especially considering how both the iPad Pro and Surface Pro 6 dwarf it in terms of power.

DESIGN AND DISPLAY

Save for the gorgeous-looking, lovely-feeling, new black colour scheme, just about nothing has changed about the Surface Pro design from the 2017 model to today's Pro 6. The tablet measures just 8.5mm thin and weighs 771g – the same as last year's model.

The tablet has all of the same ports and wireless connectivity options as before, not to mention the same Type Cover.

However, we seriously feel let down by the absence of USB-C this time around, and it's not even about any perceived benefits of the platform. Microsoft has been gating faster data transfers and wider docking capabilities behind its Surface Connect port for years, forcing anyone who wants that speed and expansion to buy its $299 Surface Dock accessory.

Not even the included USB 3.0 is up to the latest USB 3.1 standard, which is twice as fast at transferring data

"Microsoft has beefed up the battery life of the Surface Pro 6 by a considerable margin."

than the former, so it's now costing you more money than is necessary to unlock the full versatility of a device that Microsoft says can serve as your only PC.

On a more positive note, the display is moderately improved in one area but otherwise unchanged. The Surface Pro 6 display now has a stronger contrast ratio of 1,500:1 compared to the previous model's 1,300:1 figure. That means it delivers deeper blacks and even brighter colours than before – perfect for viewing movies.

PERFORMANCE

This year's Surface Pro is more powerful and capable than the last. Much of that comes through the use of quad-core processing, thanks to Intel's eighth-generation Kaby Lake Refresh processors.

Visual performance doesn't increase much in the Surface Pro 6 over the previous model, with the same graphics subsystem as before in this specification.

However, we've recorded some impressive gains in battery life as well as multi-core performance, which should see better longevity out of the tablet as well as faster video encoding and other CPU-intensive tasks – but don't expect the tablet to churn through complex media renderings and encodings or complicated spreadsheet functions.

BATTERY LIFE

Microsoft has beefed up the battery life of the Surface Pro 6 by a considerable margin, particularly when it comes to video playback. Battery life through simulated general use, represented by our PCMark 8 test, remains essentially the same as before.

However, we've witnessed a gain of one hour and 47 minutes – a near two-hour increase – in our video rundown test on Surface Pro 6. That's very impressive.

SOFTWARE AND FEATURES

Like the Surface Laptop 2, the Surface Pro 6 doesn't have many unique pieces of software and features to speak of, which is a double-edged sword. The good? There's no bloatware, as it comes directly from Microsoft.

What's also good is Windows Hello facial recognition, which uses the tablet's infra-red camera, and is fast and accurate. We can barely open the tablet from its Type Cover before we're already logged into Windows 10. The bad? There is basically nothing else in the way of unique software and features. If it's on this tablet, you can basically get it on any other Windows 10 tablet.

SUMMARY

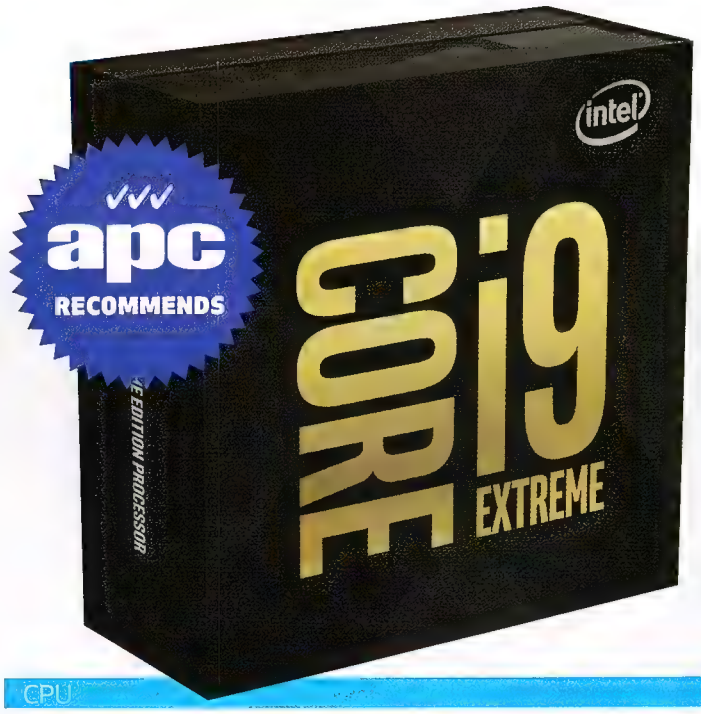
The Surface Pro 6 is Microsoft's best tablet yet. However, the changes here are incremental, when what was really needed was some drastic improvements.

Instead, the Surface Pro 6 is faster, longer lasting and now comes in a sleek, new black shell... It's a better product than last year, but barely so. If you own a Surface Pro 2017, skip this upgrade. ■ **APC team**

Verdict

The Surface Pro 6 is faster, longer lasting and now comes in a new black shell but... that's about it.

★★★★☆

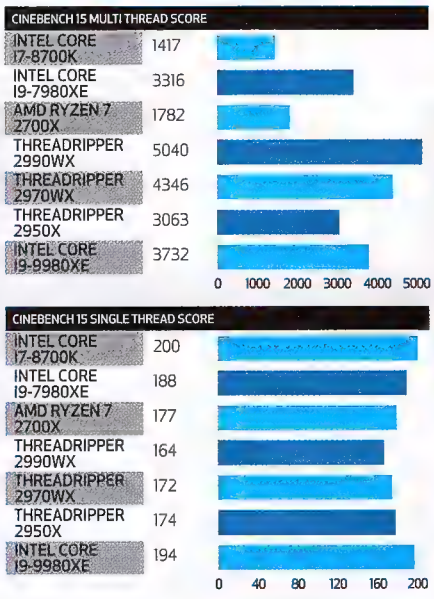


Intel Core i9-9980XE, 14nm, Socket LGA2066 18 cores/36 threads, 3.0GHz base clock, 4.5GHz max boost clock, supports up to 128GB DDR4-2666 (quad channel), 24.75MB SmartCache, 44 PCIe lanes, 165W TDP

CPU

TBA $2700+ | WWW.INTEL.COM.AU

LABS BENCHMARK RESULTS


CINEBENCH 15 MULTI THREAD SCORE
INTEL CORE I7-8700K 1417
INTEL CORE I9-7980XE 3316
AMD RYZEN 7 2700X 1782
THREADRIPPER 2990WX 5040
THREADRIPPER 2970WX 4346
THREADRIPPER 2950X 3063
INTEL CORE I9-9980XE 3732
0 1000 2000 3000 4000 5000
CINEBENCH 15 SINGLE THREAD SCORE
INTEL CORE I7-8700K 200
INTEL CORE I9-7980XE 188
AMD RYZEN 7 2700X 177
THREADRIPPER 2990WX 164
THREADRIPPER 2970WX 172
THREADRIPPER 2950X 174
INTEL CORE I9-9980XE 194
0 40 80 120 160 200

INTEL Core I9-9980XE

14nm pushed to the limit.

The core wars are in full swing. AMD may be in front thanks to its recently released 24- and 32-core Threadripper models, but multi core power isn't the be all and end all. Intel's 9th generation Skylake-X refresh promises a good blend of multi-threaded grunt combined with aggressive turbo modes and strong clock for clock performance. We've got the flagship 18 core i9 -9980XE on hand, which on paper is a very powerful processor indeed.

With 10nm processors nowhere in sight, Intel has no choice but to continue to refine its 14nm process technology. The 9980XE appears to be right on the limit of what we can expect from 14nm and the current architecture. To Intel's credit, the 9980XE is a decent step forward over the 7980XE. Its base clock is increased to 3.0GHz vs. the 2.6 GHz of the 7980XE, while all core turbo boost goes up to 3.8GHz from 3.4GHz. Peak turbo boost is now 4.5GHz for a two core load. A soldered heat spreader makes a welcome return, leading to improved heat dissipation. The 9980XE is drop in compatible with existing X299 boards after a BIOS update. Memory support remains unchanged with its quad-channel memory controller officially supporting DDR4-2666. TDP is 165W though actual power consumption can go well beyond that, especially if you're overclocking.

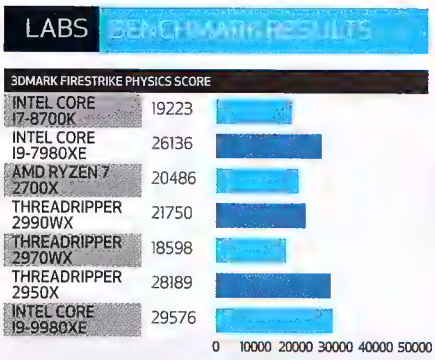
WELL ROUNDED PERFORMANCE

What matters with an expensive and powerful processor is how it performs, and the i9-9980XE does very well. It can't match the 2970WX let alone the 2990WX at highly threaded workloads, but then we wouldn't expect it to with such a large core count disadvantage. It's clearly no slouch though. The lightly threaded benchmarks and those that struggle with scaling are interesting. The Cinescore benchmark is interesting as it stops scaling at 16 cores, but the clock speed and IPC advantage sees the 9980XE pulling well ahead of the similar core count 2950X. We also see this advantage in our gaming tests which prefer clock speed over very high core counts.

Overall, performance is quite surprising. AMD's Threadripper reigns supreme when presented with workloads that are appropriately coded to take advantage of their parallel prowess, but the 9980XE is more well-rounded and suitable to a broader range of tasks. It shows the i9-7980XE a clean pair of heels thanks to much more aggressive per core turbo modes. Temperatures were also surprisingly in check with a 75c peak. If you intend to overclock to any meaningful extent, you'll need a top class AIO or custom water cooling as we saw peaks in the 90s with a quick and dirty 4.2GHz all core OC. You'll also need a very capable PSU capable of pushing a lot of current through the EPS connector(s).

> "Intel's 9th generation Skylake-X refresh promises a good blend of multi-threaded grunt combined with aggressive turbo modes and strong clock for clock performance."

LABS BENCHMARK RESULTS


3DMARK FIRESTRIKE PHYSICS SCORE
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INTEL CORE I9-7980XE 26136
AMD RYZEN 7 2700X 20486
THREADRIPPER 2990WX 21750
THREADRIPPER 2970WX 18598
THREADRIPPER 2950X 28189
INTEL CORE I9-9980XE 29576
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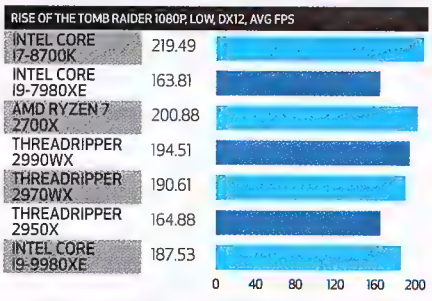
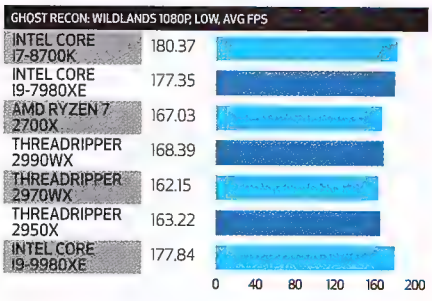

RISE OF THE TOMB RAIDER 1080P, LOW, DX12, AVG FPS
INTEL CORE I7-8700K 219.49
INTEL CORE I9-7980XE 163.81
AMD RYZEN 7 2700X 200.88
THREADRIPPER 2990WX 194.51
THREADRIPPER 2970WX 190.61
THREADRIPPER 2950X 164.88
INTEL CORE I9-9980XE 187.53
0 40 80 120 160 200


GHOST RECON: WILDLANDS 1080P, LOW, AVG FPS
INTEL CORE I7-8700K 180.37
INTEL CORE I9-7980XE 177.35
AMD RYZEN 7 2700X 167.03
THREADRIPPER 2990WX 168.39
THREADRIPPER 2970WX 162.15
THREADRIPPER 2950X 163.22
INTEL CORE I9-9980XE 177.84
0 40 80 120 160 200

CAREFULLY CONSIDER YOUR X299 MOTHERBOARD CHOICE

When Skylake-X was released, there were concerns over the capabilities of the VRM and cooling solutions used on many of the first wave X299 models. For the most part this was overblown, especially if you were using the lower core count CPUs. The problem was that pushing 16 or 18 core CPUs hard puts a LOT of stress on the motherboard VRM. This was exacerbated by the tendency of motherboard manufacturers to apply non-standard turbo boost modes. For our testing, we used an Asus ROG Strix X299-XE motherboard which comes with a larger heatsink, making it better equipped to handle the demands of fully loaded extreme core count CPUs.

The Strix X299-XE is what we'd call a middle of the range X299 motherboard. Even though it comes with a $500 price tag, in X299 terms, that's far from top end pricing. You get a nice well rounded package with a good set of enthusiast features and a well done RGB implementation. You won't find some bells and whistles like 10GbE or U.2 ports but then those things are less important on a gaming oriented board like the Strix. If you're into gaming then the Strix X299-XE is worth a look, but you really need to be doing something else to justify the additional cost over the mainstream platform. If you're one of those gamers who can make use of the X299 and CPUs with all that multithreaded grunt, then by all means check out the Strix X299-XE.

> "If you're into gaming then the Strix X299-XE is worth a look, but you really need to be doing something else to justify the additional cost over the mainstream platform."

A TRUE FLAGSHIP WITH A PRICE TO MATCH

Pricing is the 9980XE's biggest problem. The multicore performance of the cheaper AMD 2970WX is better, while the 2950X goes close to matching the 9980XE at around half the price. If Intel did lower price, it would risk cannibalizing sales from its lucrative enterprise market, so unfortunately a hefty price drop is unlikely. As it stands though, the i9-9980XE is a capable flagship processor across a wide range of tasks that's only let down by its eye-watering price.. ■

Chris Szewczyk

Verdict

The i9-9980XE is surprisingly well rounded at both lightly and heavily threaded workloads.

★★★★☆

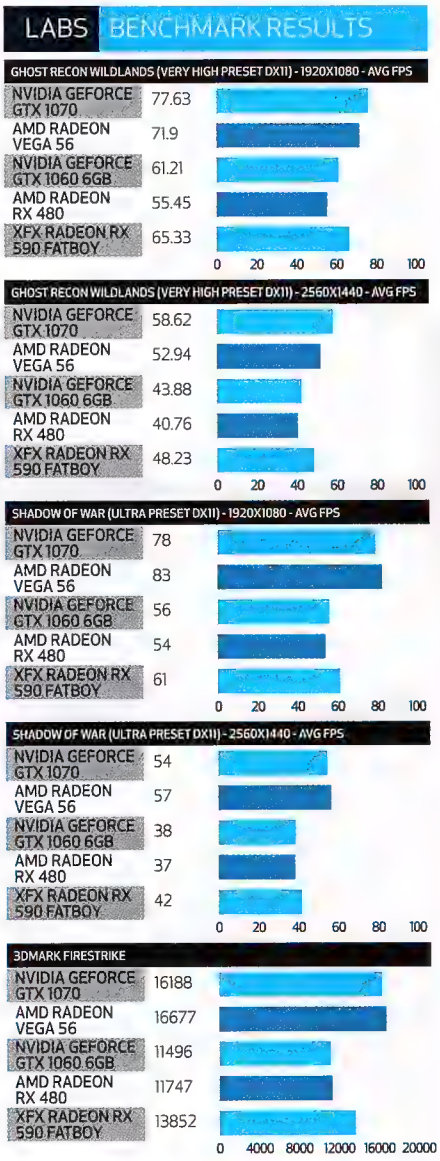
XFX RX 590 Fatboy OC+ 8GB; 2304 Stream Processors; 1580MHz Clock Speed; 8GB GDDR5 8000MHz Memory; 3x DisplayPort 1.4, 1x HDMI 2.0b and 1x Dual-Link DVI-D; 225W TDP

GPU

$429 | WWW.XFXFORCE.COM

XFX Radeon RX 590 Fatboy

Polaris returns... again.


LABS BENCHMARK RESULTS
GHOST RECON WILDLANDS (VERY HIGH PRESET DX11) - 1920X1080 - AVG FPS
NVIDIA GEFORCE GTX 1070 77.63
AMD RADEON VEGA 56 71.9
NVIDIA GEFORCE GTX 1060 6GB 61.21
AMD RADEON RX 480 55.45
XFX RADEON RX 590 FATBOY 65.33
0 20 40 60 80 100
GHOST RECON WILDLANDS (VERY HIGH PRESET DX11) - 2560X1440 - AVG FPS
NVIDIA GEFORCE GTX 1070 58.62
AMD RADEON VEGA 56 52.94
NVIDIA GEFORCE GTX 1060 6GB 43.88
AMD RADEON RX 480 40.76
XFX RADEON RX 590 FATBOY 48.23
0 20 40 60 80 100
SHADOW OF WAR (ULTRA PRESET DX11) - 1920X1080 - AVG FPS
NVIDIA GEFORCE GTX 1070 78
AMD RADEON VEGA 56 83
NVIDIA GEFORCE GTX 1060 6GB 56
AMD RADEON RX 480 54
XFX RADEON RX 590 FATBOY 61
0 20 40 60 80 100
SHADOW OF WAR (ULTRA PRESET DX11) - 2560X1440 - AVG FPS
NVIDIA GEFORCE GTX 1070 54
AMD RADEON VEGA 56 57
NVIDIA GEFORCE GTX 1060 6GB 38
AMD RADEON RX 480 37
XFX RADEON RX 590 FATBOY 42
0 20 40 60 80 100
3DMARK FIRESTRIKE
NVIDIA GEFORCE GTX 1070 16188
AMD RADEON VEGA 56 16677
NVIDIA GEFORCE GTX 1060 6GB 11496
AMD RADEON RX 480 11747
XFX RADEON RX 590 FATBOY 13852
0 4000 8000 12000 16000 20000

With all the attention that high end cards have been receiving in recent months, it's sometimes easy to forget that they're very expensive parts, well outside the budgets of 'normal' consumers. The vast majority of gamers running 1080p screens look for more worldly options including the GTX 1060, RX 580 and now RX 590. We patiently await genuinely new mid-range entrants, but while we do that, let's take a look at the RX 590, the third iteration of the venerable Polaris architecture.

The RX 590 is essentially a faster version of the capable RX 580, which is itself a refresh of the RX 480. The RX 590's main change is the switch from a 14nm GPU to one manufactured with a 12nm process. This allows the RX 590 to provide higher clock speeds, though it does come with the cost of higher power consumption. It's clear that AMD is pushing to extract the maximum performance from this GPU.

AMD sampled us with the unusually named XFX Radeon RX 590 Fatboy. It's a custom factory overclocked design featuring 8pin and 6 pin power connectors and a beefy 2.5 slot twin axial fan heatsink. It's quite a step up from the original noisy AMD Polaris blower coolers. It comes with a healthy set of video outputs consisting of three DP 1.4, one HDMI 2.0b and a single Dual Link DVI. There's also a performance/quiet mode BIOS switch. It's not the most gorgeous card we've ever seen, but it gets the job done.

The RX 580's performance is quite good. It closes the gap to the likes of the GTX 1070 and RX Vega and can happily game at 1440p, though it's better suited to 1080p gaming. The worry for AMD is what Nvidia is no doubt cooking up. Ultimately it's that future card that will determine where the RX 590 sits. For now, the RX 590 is the 1080p king. We weren't so impressed with the increased temperatures and power consumption of the RX 590. In fact we measured almost 100w greater power draw than the GTX 1060. We really want a new mid-range architecture!

AMD is bundling some very desirable games with the RX 590, which goes a long way to explaining its price premium. Resident Evil 2, The Division 2 and Devil May Cry 5 are probably worth $200 all together.

The RX 590 does exactly what we expect. It's a bit faster than the RX 580 at the expense of higher power consumption. It costs a bit more too. While it's faster than the ageing GTX 1060, if you're not interested in the value adding games, the RX 590 it's not a very compelling purchase at this time and price. If you're in the hunt for a mid-range GPU, the RX 580 remains an almost-as-good and better value option (and you can still choose from two of those three games). The wait goes on for something that really gets us excited in the super competitive mid-range battleground.

Chris Szewczyk

Verdict

The RX 590 is a highly competent 1080p performer but the RX 580 remains a better buy.

apc HOT PRODUCT

CASE

$119 | WWW.THERMALTAKE.COM.AU

Thermaltake Level 20 MT ARGB

The latest Level 20 case merges RGB excess with subtle styling.

When you see Thermaltake's new case in action, full of slick PC hardware and lit up like some frame-rate spewing Xmas tree, you'd think you're looking at a very high-end case that only the most dedicated enthusiast could afford to build into. It's got a lot of higher-end bells and whistles, but is paired back where it counts, meaning this striking ATX chassis brings the looks, while still only costing $119.

The most striking thing about the case at first glance is its impressive cooling. Out of the box the Level 20 MT ARGB boasts three 120mm intake fans and a 120mm exhaust. The front fans are about as blinged as you can get, featuring addressable RGB lighting that's designed to work with lighting software from Asus, Gigabyte, and MSI – they all plug into a small PCB on the back of the motherboard plate, which in turn plugs into the motherboard. The rear fan also plugs into this, but is detached out of the box to make mobo installation a bit easier. All this lighting is controlled by a single button on the top panel IO – you can cycle through the case's own lighting patterns, or with a longer click hand it over to software control.

Tempered glass panels are all the rage these days, and Thermaltake's plonked two on the MT. Not only do you get a tempered glass sidepanel, which is a basically one big, black-lined slab with a metal frame on each side, but the front panel features a tempered glass plate as well. There are subtle intake vents on either side of this panel, but overall it really lets the RGB fans shine. There's cool stuff everywhere – the top panel features a magnetically attached mesh filter, while on the non-windowed panel there's a fine series of cutouts protecting another magnetic mesh panel.

The MT offers excellent stock airflow, enough to keep the case at a positive air pressure while powered up, and help keep dust out of the system, and you can put more fans on the top and sidepanels if you really need them. If you don't like relying on air-cooling, there's room for radiators on the front and side panels, up to 360mm and 240mm respectively.

To help with cable management there's a shroud covering the bottom of the case, with a cut out just large enough to show a portion of the PSU. This is also where a hidden drive caddy sits, with room for two 3.5in or 2.5in drives, and there's a bracket for another SSD bracket behind the motherboard plate. There's also an SSD bracket sitting on top of the shroud, and both SSD brackets are removable for easy installation. There's also a series of hexagonal cutouts in the right-hand side of the motherboard tray, which boosts either case airflow or supports the aforementioned 240mm radiator. And it's quite attractive, to boot!

About the only criticism – and I had to reach for it – I could make is that there's not a huge amount amount of space behind the motherboard tray. That's small beer, really; for the price you're paying the Level 20 MT ARGB has more than enough going to for it. ■

David Hollingworth

Verdict

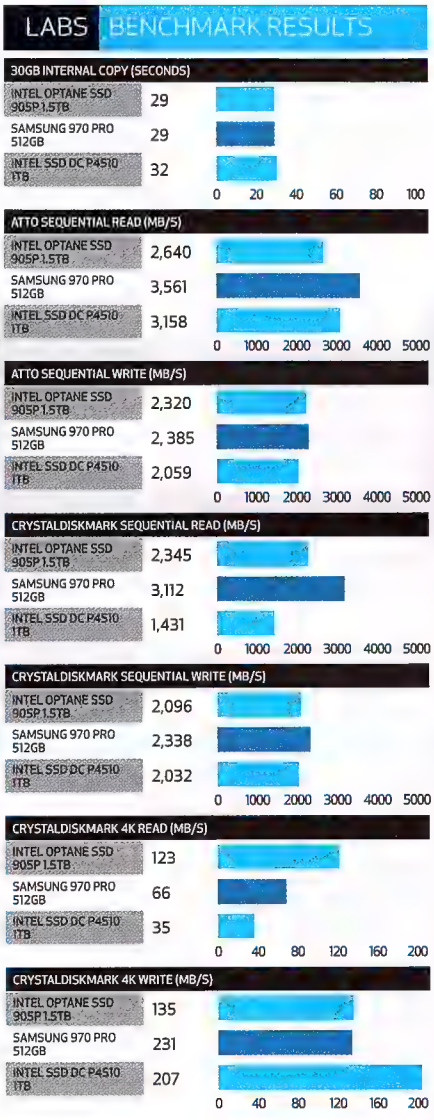
RGB lighting we actually like, a roomy interior, and elegant design make a strong case.

★★★★½

apc RECOMMENDS

SSD

US$3,240 | WWW.INTEL.COM


LABS BENCHMARK RESULTS
30GB INTERNAL COPY (SECONDS)
INTEL OPTANE SSD 905P 1.5TB 29
SAMSUNG 970 PRO 512GB 29
INTEL SSD DC P4510 1TB 32
0 20 40 60 80 100
ATTO SEQUENTIAL READ (MB/S)
INTEL OPTANE SSD 905P 1.5TB 2,640
SAMSUNG 970 PRO 512GB 3,561
INTEL SSD DC P4510 1TB 3,158
0 1000 2000 3000 4000 5000
ATTO SEQUENTIAL WRITE (MB/S)
INTEL OPTANE SSD 905P 1.5TB 2,320
SAMSUNG 970 PRO 512GB 2,385
INTEL SSD DC P4510 1TB 2,059
0 1000 2000 3000 4000 5000
CRYSTALDISKMARK SEQUENTIAL READ (MB/S)
INTEL OPTANE SSD 905P 1.5TB 2,345
SAMSUNG 970 PRO 512GB 3,112
INTEL SSD DC P4510 1TB 1,431
0 1000 2000 3000 4000 5000
CRYSTALDISKMARK SEQUENTIAL WRITE (MB/S)
INTEL OPTANE SSD 905P 1.5TB 2,096
SAMSUNG 970 PRO 512GB 2,338
INTEL SSD DC P4510 1TB 2,032
0 1000 2000 3000 4000 5000
CRYSTALDISKMARK 4K READ (MB/S)
INTEL OPTANE SSD 905P 1.5TB 123
SAMSUNG 970 PRO 512GB 66
INTEL SSD DC P4510 1TB 35
0 40 80 120 160 200
CRYSTALDISKMARK 4K WRITE (MB/S)
INTEL OPTANE SSD 905P 1.5TB 135
SAMSUNG 970 PRO 512GB 231
INTEL SSD DC P4510 1TB 207
0 40 80 120 160 200

Intel Optane SSD 905p 1.5TB

Intel ups Optane's ante once again

Déjà vu all over again? Yup, it's another Optane drive from Intel. It's an intriguing contradiction that Optane has us at one and the same time wondering how on earth the company can put out yet another spin on its Optane product line so soon, and also considering whether, with this particular drive, Optane is finally going to absolutely, unambiguously deliver on its immense hypothetical promise.

Enter the Intel Optane 905p. As the name suggests, it's a refresh of the 900p premium consumer product. That makes it either a second or third-generation 3D Xpoint technology implementation, depending on how you look at it. Whatever, as the tech matures, expectations harden. A little leeway is inevitable for a radical new technology, but Optane has been around long enough that we'd like to be able to say it's just darned fast, as opposed to pointing your attention at the low latency and hope you don't notice the patchy bandwidth. The problem, of course, is that the underlying 3D Xpoint chips remain first generation.

But never mind, what's new with the 905p? It's been around for a few months in 480GB and 960GB variants, but this huge 1.5TB version is very much the latest thing. Broadly, it's a refinement of the existing 900p series, rather than a radical departure. There's a moderately revised seven-channel controller and firmware, still of Intel's own making, and the speeds and feeds are slightly up on the 900p. So, reads are now claimed to peak at 2.6GB/s, with writes at 2.2GB/s. Similarly, the IOPS ratings have crept up to 575K and 500K respectively for reads and writes.

The very latest flash drives can match or beat all those numbers, of course, and sometimes by a large margin. Samsung's 970 Pro is good for up to 3.5TB/s of sequential reads. Anyway, by the numbers, the new 1.5TB 905p performs pretty much in line with expectations when it comes to sequential throughput, which means it's fast, but not electrifying.

Of more interest are the 4K numbers. Here the 905p puts in an extremely strong 4K read performance of 123MB/s. That's roughly twice as fast as the Samsung 970 Pro. On the other hand, the Samsung is about 70 percent faster for 4K writes. In our real-world internal file copy test, it's neck and neck, with both doing it in 29 seconds, which works out at slightly over 1GB/s of throughput. Impressively, the 905p will keep that rate up seeming indefinitely. We filled the drive up prior to testing, and it maintained that performance for all 1.5TB.

You could argue that simple sequential tests don't give much insight into real-world performance. In that scenario, the 905p's neatly symmetrical 4K performance and internal file copy endurance show its true real-world strengths. Random read performance is particularly important to the end user experience, and it's where the 905p is strongest. So, the numbers still aren't all there, but, subjectively, there probably isn't a drive that will make your PC feel faster than the 905p. ■

Jeremy Laird

Verdict

Super-performance where it subjectively counts; big endurance advantage over flash drives.

★★★★½

apc RECOMMENDS

MESH WI-FI

$220 | SYNOLOGY.COM

Synology MR2200ac

The popular NAS-maker's third router adds mesh but loses some hardware features.

Taiwanese NAS-maker Synology has slowly been building itself a respectable reputation in the router market, releasing three models in as many years, with this tri-band, Qualcomm-powered MR2200ac, the latest addition to the family. Like its forbears, the RT1900ac and RT2600ac, this is another highly-capable and feature-packed unit where the real star is theOS. Simply named 'Synology Router Manager' (or SRM), the latter takes its cues from the company's NAS operating system, combining a very easy-to-use desktop-like interface (which you access via web browser) with features that are frequently more advanced than you get from long-established router manufacturers.

The MR2200ac differs from its predecessors in that it's geared for mesh networking. Although it can work fine on its own as a standard modem-less broadband router (albeit a fairly simple one, hardware wise – there's only two Ethernet ports in the back, one of which can only be used for WAN connections), Synology's real intention is for you to buy at least two of these and then pair them into a mesh network to seamlessly extend Wi-Fi to wherever you need it. If you want a more substantial router for your main device, Synology's also enabled this mesh functionality in the older RT2600ac via an OS update, so you can use it in conjunction with one or more MR2200acs.

Internally, this new model runs a quad-core, 717MHz Qualcomm CPU and pairs that with 256MB of memory and 4GB of onboard storage for installing additional optional apps. In the wireless department, you're getting 2x2 MIMO 802.11ac with two 867Mbps 5GHz radios and one 400Mbps 2.4GHz radio. In mesh mode, one of those 5GHz channels becomes a dedicated backchannel for node-to-node communication, meaning you shouldn't get bottlenecks.

For this review, we tested with two MR2200acs and found wireless performance was generally first rate, reaching 60MB/s when connecting to the primary node and, with the secondary node two rooms and 10m away, we hit 25.7MB/s reads and 38MB/s writes – super competitive writes and good for reads.

Positioning mesh nodes can always be tricky, but Synology's actually made this easier by including built-in speed testing in the router OS, as well as three-bar status lights that indicate how strong a secondary node's signal is back to the main one. On the downside, the 1.2m power cable is frankly a bit short, which limits your placement options.

The biggest new feature, software wise, is a redesign of the SRM OS's parental features, which are now best-in-class, letting you filter content using a huge number of possible variables and presets (as well as manual customisation) and even manage internet time allowances on a per-user basis – so it'll track little Timmy's web use on the tablet as well as the laptop and tally a total from the two.

This is another great-performing, highly-customisable router from Synology that's perfect for those who want a lot of options of how their network operates. ■ **Dan Gardiner**

Verdict

A very capable mesh router with a superb OS that brings many best-in-class features.

★★★★½

apc RECOMMENDS

NAS

$1,199 | QNAP.COM

QNAP TVS-951X NAS

QNAP's loaded this unit with every feature you could want from a NAS and still managed to keep the price reasonable.

QNAP's TVS-951X NAS is best described as the "kitchen sink" of NAS units. There isn't a feature that one could reasonably desire that isn't included by default on the TVS-951X. That doesn't necessarily mean the TVS-951X is perfect, but QNAP has shoved heaps of goodies in this box.

Kicking things off is an Intel Celeron 3865U CPU. Due to packing an Intel-based CPU, this means there's an enormous suite of applications available, if there's a particular service or app you want to run on your NAS, the Celeron 3865U will take it. An added bonus of the Celeron 3865U CPU is QuickSync video encoding and decoding support, so Plex will transcode videos without breaking a sweat.

Out of the box QNAP equips the TVS-951X with either 2GB or 8GB of RAM depending on how much cash you shell out, but can be expanded out to 32GB via the two DDR4 SO-DIMM slots. This amount of RAM plus the Intel CPU make the TVS-951X very capable for running most server style apps.

Like many QNAP units the TVS-951X has an HDMI port. This unique feature allows you to plug it directly into a TV to either watch videos directly off the NAS instead of the network. It's more likely however, that the HDMI port will be used to hook up a monitor or TV and used to display the output of QNAP's surveillance camera software, so you can monitor a group of cameras all at once. The TVS-951X does support a remote control, but oddly it's an optional purchase.

What makes the TVS-951X unique is the inclusion of nine - yes, nine - hard drive bays. There are five 3.5-inch slots for your big beefy storage needs, plus four 2.5-inch bays that are primarily designed to be filled with SSDs and used as a cache. Using QNAP's "Qtier" technology, frequently accessed data is automatically shifted between the HDDs and SSDs for improved performance. You can also manually set applications to be run off the SSDs and leave the HDDs for bulk storage only. It's a very nifty way to leverage the rapidly falling prices for commodity 2.5-inch SSDs without having to sacrifice the bulk storage pricing of traditional HDDs.

To round the package out, there's a 10GbE LAN port, as well as a traditional Gigabit Ethernet port. While you can certainly hook the 10GbE port up to a switch and enjoy using the TVS-951X that way, it's more likely users of this class of NAS will connect their desktop PC with a 10GbE network interact directly to the 10GbE port on the NAS and use it as a form of very fast directly attached storage for editing video.

Most people probably don't need the additional 2.5-inch bays the TVS-951X is based around and for many users, 10GbE is more of a luxury than a necessity. But if you do require those features and can make use of them, the TVS-951X is a good buy compared to the rest of the market at a relatively low street price of $1,200.

Anthony Agius ■

Verdict

A generous nine hard drive bays and a full suite of features make this an excellent do-it-all NAS.

★★★★½

NETWORKING

$799 | QNAP.COM

QNAP QSW-1208-8C 10 Gigabit Switch

12 ports of 10 Gigabit Ethernet glory for a remarkably low price.

Ten gigabit Ethernet (aka 10GbE or 10GBASE-T) has been around for a while but has been mostly relegated to the data centre due to cost. In the last few years 10GbE has trickled down to small businesses, but is still confined to the server cupboard due to expense and noise. With the new QNAP QSW-1208-8C switch, 10GbE might finally be ready for the prosumer's home office.

Let's start off with the QSW-1208-8C's price – $799. There's not much on the market that comes even close. Many other network switches contain two or even four 10GbE ports, but 12 ports for under $800? Nice work QNAP! The closest competitor would be the Netgear XS708T, which retails for just under $1,000.

Unlike Netgear's XS708T however, QNAP's QSW-1208-8C is an unmanaged switch, which means you can't do stuff like configure VLANs, restrict network access at a physical level, redundancy, network traffic analysis or any of that fun stuff. This is just a dumb packet forwarder, plug and play. Probably not an issue for this switch's target audience (the SOHO/prosumer crowd), but it's one of the sacrifices made in order to reach a price point.

Where things get weird is the QSW-1208-8C's port selection. There's a total of 20 ports on the front of this thing, but you can only use 12 at once. There's four dedicated 10G SFP+ (for fibre optic cables) ports, eight RJ-45 (copper) ports and eight additional 10G SFP+ ports. The eight RJ-45 and SFP+ ports share port numbers (there's two port nines for example) but have separate physical connections. If you plug a cable into the same numbered RJ-45 and SFP+ port, the RJ-45 port takes precedence, disabling the SFP+ port.

Don't forget that with SFP ports, you need to provide your own transceiver to suit the type of fibre optic cable you're using. They're relatively cheap to buy (under $50 each), but QNAP didn't include them as it's another way to keep costs down.

Performance wise, yep, the QSW-1208-8C does what it says on the box; 10GbE switching, with iperf3 benchmark speeds using shielded CAT6 cable hitting over 9.1 Gbits/sec between a Linux server and an iMac Pro. Real world file copies between two Windows 10 PCs with 10GbE network cards and PCIe SSDs reached around 900MB/sec too.

Be sure to use a high quality CAT6 network cable however, as when using regular CAT5 or even good quality CAT5e, speeds tended to fluctuate. This didn't occur when using CAT6 cables. If you need a cable run further than 50 meters, go for CAT6A cabling or multi-mode fibre, as CAT6 will tend to crap out after 40-50 meters.

If you don't need any fancy networking mumbo jumbo and just want the fastest network connection possible between your PCs kitted out with 10GbE network cards and network attached storage devices also equipped with 10GbE network cards, QNAP's QSW-1208-8C is an easy buy. It's quiet, fast, easy to use and most important of all, very well priced.

Anthony Agius ■

Verdict

Astonishing value considering the performance and features.

★★★★½

apc RECOMMENDS

NAS

$1,200 | WWW.SYNOLOGY.COM

Synology DS1618+

A high powered yet flexible NAS for prosumers or small business owners.

Aimed at those who need large but fast storage capacity at an affordable price (think video or picture editing), the Synology DS118+ offers a lot of functionality for the $1,200 price tag.

At its core is the efficient 14nm Intel Atom C3538 CPU that offers four cores that can boost up to 2.1GHz, plus 4GB of DDR4 RAM. It's dual channel, too, for extra performance, can be upgraded to 32GB or swapped out for ECC memory instead. Round the back the NAS has four Gigabit LAN ports, which support both link aggregation and failover support. You also get three USB 3.0 ports (one of which is on the front) and two eSATA connection for adding external drives, or even a Wi-Fi adaptor. Using the Synology DX517 expansion units, it's possible to reach a total of 224TB of storage.

But the real standout feature of the DS1618+ is the PCIe expansion slot, which allows for some handy upgrades. Most usefully, you can drop in a 10 Gigabit Ethernet card ($250), for very high performance file transfers. For those who need fast random access speeds, you can add an SSD adapter card – either supporting M.2 SATA drives only ($225), or both SATA and the faster M.2 NVMe SSDs ($250).

Like most modern NAS, getting the Synology DS1618+ spooled up and running is very easy thanks to tool-less drive bays, a quickstart guide and a wizard that walks you through the process. We opted for the Synology Hybrid RAID system, which is a good mix between redundancy and storage capacity, and is well equipped to handle a mix of drives, and future upgrades. If you use Seagate IronWolf drives (as tested), you can directly monitor drive health and stats from the NAS interface, using Seagate IronWolf Health Management. During testing the DS1618+ happily maxed out the throughput of a single Gigabit network connection (113.2 MB/s reading, 111.7 MB/s writing) for large file copies. Maximum speeds with 10 Gigabit Ethernet depend on your RAID and network setups, but transfer rates of 1000 MB/s+ are typical. Under heavier load the 92mm fans can be a bit noisy, so you don't want the DS1618+ too close to your workspace.

On the software side, the DS1618+ has an extremely comprehensive and flexible backup solution, plus oodles of security options baked in. You can also easily share and manage files, including creating a personal cloud. The NAS can also run a VPN server, host email or support recording from up to 40 IP cameras. It's also DLNA streaming ready and supports 1080P transcoding. Not to mention Synology have over 100 add-on apps available, making it very easy to add the extra functionality you need.

The DS1618+ ability to run a virtual machine, including another copy of the NAS DSM or Linux or Windows. This is a great option for experimenting with operating systems, or running specific software. No more than four at once is recommended, and of course you'll want to upgrade the RAM first.

All in all, the DS1618+ happily outperforms our expectations considering the relatively affordable price, and has plenty of scope for future upgrades.

Lindsay Handmer

Verdict

Great performance out of the box, with excellent options for add an ups and hardware upgrades.

PSU

$549 | WWW.ASUS.COM.AU

Asus ROG Thor 1200w Platinum

Asus takes a hammer to the PSU market.

Along with a pair of new ROG AIO CPU coolers we're reviewing from Asus, there's now a power supply unit in the company's stable. The Thor 1200W is the first Asus ROG power supply and like all ROG products, it has some interesting innovations that differentiate it from its competitors.

Asus is clearly looking to leverage the prestige of its ROG brand by expanding into components beyond its traditional motherboard and graphics card portfolios. Making a PSU from scratch is not an easy undertaking though, so Asus partnered with Seasonic to provide the platform for the Thor. The Thor is a 1200w rated power supply, though there's also an 850W version too.

The 12v rail can supply up to 100A, which is enough for all but the craziest multi GPU systems. It carries an 80Plus Platinum rating. We'd like to have seen a Titanium rating, but alas it's not to be.

It's hard to describe a PSU as 'attractive', but the ROG Thor is exactly that. It's black stylised casing looks great, and as you'd expect from almost any gaming product these days, there's a few splashes of RGB lighting that are tastefully implemented.

The unique standout is the inclusion of a small OLED readout that shows how much AC power the PSU is drawing from the wall socket. This alone could be the deal maker for users weighing up purchasing one, as power consumption information is important to a lot of users. Of course you need a windowed case without a PSU shroud to make use of it, however. The little display is a good first step but we think it could be improved by adding detailed DC monitoring. For example you could select the PCIe rails or the EPS power connector to see how the power is being used. Perhaps a small detachable readout would be beneficial for those who cannot see the PSU panel itself.

Unfortunately we don't have the expensive equipment to properly test power supplies, which is why we rarely cover them. Our test system with an i7-8700K and GTX 1080 Ti is a breeze for a high powered unit like this. It remained quiet and cool, a hallmark of highly efficient PSU models these days.

The Asus ROG Thor is no doubt a very high end PSU that looks fantastic, has a great spec and was completely inaudible throughout our testing. Like a lot of ROG products though, you really do have to pay a premium as it comes in at $549. At this price it's up there with the flagship Titanium models from the likes of Corsair and Cooler Master. However, it's not exorbitant for what you get. No other model has the good looks that the Thor has. While we think Asus could have done a little more with regards to the OLED display, the Thor is a solid first attempt from Asus. Throw in a 10 year warranty and the Thor 1200W could well power through many upgrades.

Chris Szewczyk

Verdict

The Thor 1200W is a pricey but lovely looking, highly capable and effectively silent PSU.

★★★★½

THE THERMALTAKE LEVEL 20 MT RGB MID TOWER

THE IDEAL CASE FOR YOUR NEXT BUILD.

With the new year fast approaching, building a new PC is sure to be high on a lot of people's to-do lists – it's a good summer project, and it's important to refresh occasionally. Maybe you've already picked out your preferred graphics card, thought about a new monitor, figured out roughly how much your budget is, what specs you'll need, and what you're use it to run.

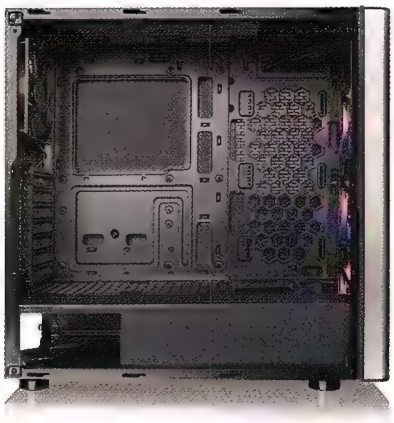
But when building the PC of your dreams, it's important not to overlook the case you house everything in. The ideal case won't just comfortably hold everything you need to run the latest games – it'll offer proper ventilation and cooling, it'll be made from high quality materials, and it'll look the part. You want a case that looks right at home if you take it to a LAN, which isn't too heavy to cart around, but also one that fits right into a home office environment – a case that's fun to show off without being overly showy. It shouldn't be something you have to set aside your entire PC budget for – the ideal case should make your set up look as impressive as possible without breaking the bank.

EASY, FLASHY AND FLEXIBLE

The Thermaltake Level 20 MT RGB Mid Tower is a mid-sized case option that fits the bill and is a great fit for all kinds of different builds. It weighs in at 6.75kg, measuring in at 455 x 204 x 471mm (height, width, depth), with two USB 3.0 ports on the front, along with a port for HD audio. The case itself is black, a simple, attractive, classical design. Cases of a similar size will often be made mostly of hard plastic parts, but both the frame and the motherboard tray are cut from SPCC steel, making for a higher quality case that feels as good as it looks.

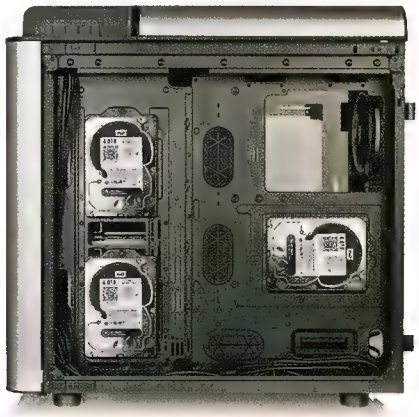
A JOY TO BUILD

This is a case designed to make building and maintaining your PC easy! It's classy and stylish without being gaudy, with an attractive design that features an enlarged

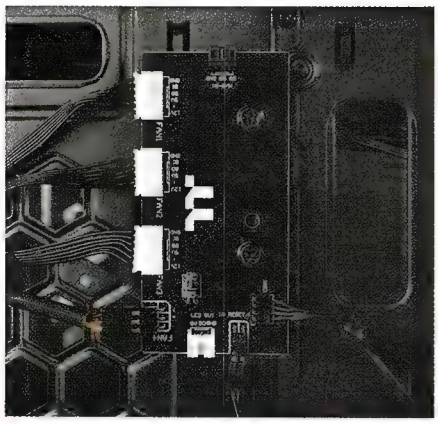


The vast interior allows your build to be exactly how you want it.

Plenty of airflow means cooler gear and less noise as the fans can run slower.



Mounting your storage flush with the case means you don't sacrifice space.



The Thermaltake Level 20 MT includes a fan controller pre-installed.

side panel window of 4mm tempered glass to show off your PC's guts and spectacular RGB intake fans on the front. But the Level 20 MT is much more than just a pretty case. It's a perfect model for your next PC build, whether you're looking to put together a gaming PC, a multimedia focused machine, or a workstation with some serious personality. In fact, it's ideal for an all-in-one build that will last many years.

EXPANSIVE OPTIONS

As a mid-size case, there's plenty of room for all the essential parts. It can take an ATX, Micro ATX or Mini ITX motherboard, with seven expansion slots available so that you can plug in GPUs, wireless adaptors, or anything else you might like to. There's also space for an optional standard PS2 PSU inside. If you're a hobbyist or beginner, this is ideal – you can start small and know that you'll have plenty of room to expand later if you want to beef up or improve your PC. You can fit in a CPU cooler of up to 170mm in length, any portable storage device under 170mm, or a graphics card up to 366mm (260mm if you have a radiator in there as well).

This is an ideal case for keeping your components cool. Along with a hefty exhaust fan, the MT features three pre-installed RGB 120 x 120 x 25mm front intake fans on the front. These three are addressable through software and give the case a unique, brilliant aesthetic. Pressing the case's RGB switch allows you to switch between different modes of lighting, changing colour schemes and shifting between 'wave' and 'flow' mode, giving you some serious customisation options.

THE CHOICE IS CLEAR

All of this is offered at a competitive price point, too, so you'll have plenty of your budget left over for everything else. The Thermaltake Level 20 MT RGB Mid Tower offers everything you could want from a case of its size, and will satisfy the needs and wants of tinkerers, beginners, enthusiasts and experts alike. If you're looking to build a new computer in 2019, or rebuild your current machine, this is the case for you.

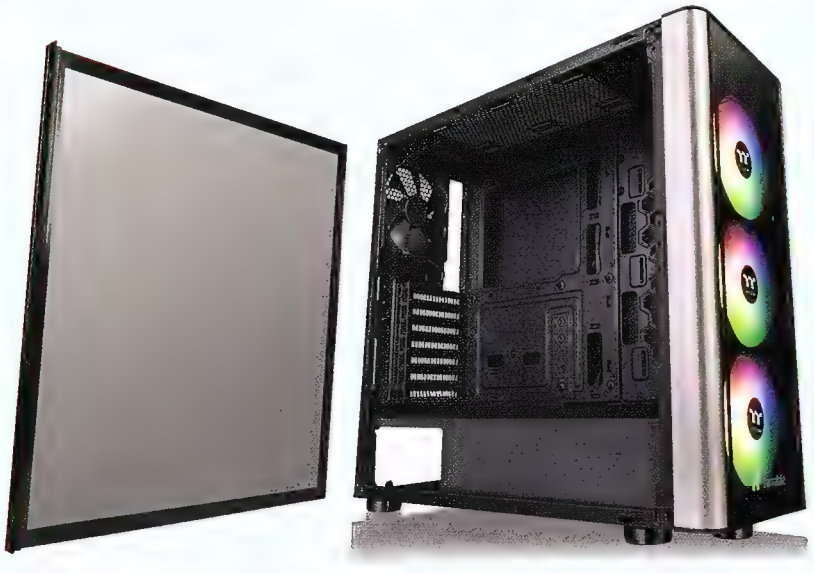
Full compatibility with Thermaltake's brilliant RGB fans and components!

MAKE YOURS ONE OF A KIND

The RGB synch function built into the case means that it's compatible with Thermaltake's other RGB products, such as the Riing Plus 12 LED RGB Radiator Fan TT Premium Edition, which can be outfitted in several locations within the case. Thermaltake offers a huge range of compatible RGB products, such as the All-in-One Water 3.0 Ring RGB 240, which you can slot into the front or side of the Level 20 MT RGB Mid Tower. This is an option if you want AIO Liquid Cooling, or there's room to side mount a radiator cooler on the motherboard tray side if you're putting together a PC that's really going to run hot.

The RGB products inside your case can be synched up to music, customised to match your gaming exploits, or can simply be set to glow and show off the innards of your PC. With its glass side and front intake fans, the Thermaltake Level 20 MT RGB Mid Tower is a perfect case for anyone looking to get into RGB lighting in a big way.

The case is also compatible with Asus Aura Sync, Gigabyte RGB Fusion and MSI Mystic Light Sync, so you can customise how you see fit depending on your preference or what you might already own. The case supports up to ten fans across the front, top, rear, right side and bottom, so you'll never have to worry about all your more expensive parts overheating – and you can be assured that all the fans keeping your PC cool will look great.



The easily removable tempered glass side panel adds a touch of class.

Head to head: USB-C vs. HDMI vs. DisplayPort

DVI is pretty much dead. VGA ports are but a distant memory.

Welcome to 2018, and the age of the modern digital video connection, where HDMI and DisplayPort rule, the latter in the form of both dedicated DisplayPort sockets and courtesy of an alternate mode via the neat little USB-C connector. But how do these cutting-edge video interfaces compare? Does it matter whether you're gaming or hammering through spreadsheets? Let battle commence.

Round 1

BANDWIDTH

In this age of ever higher resolutions, color depths, dynamic ranges, and refresh rates, the most important metric for any digital display interface is bandwidth. Intriguingly, it's a moving target. Today, 2K displays with 144Hz refresh are becoming more popular. Tomorrow, it will be 4K, then in a few years, 8K and plenty of Hz. This also applies to the interfaces. HDMI first appeared in 2002, and supported up to 3.96Gb/s of raw data, and a maximum resolution of 1920x1200 at 60Hz. Today, the HDMI standard in available devices is at 2.0b spec, delivers 18Gb/s, and maxes out at 3840x2160 at 60Hz. HDMI 2.1 increases that hugely to 48Gb/s, but has yet to appear in shipping devices. The situation with DisplayPort is more complicated. Version 1.4 is the latest spec you'll find, and enables a maximum total bandwidth of 32.4Gb/s. However, by way of example, while Nvidia's GeForce 10 graphics chipsets support DP1.4, it's not implemented in all boards. For some, it can be enabled in a firmware update. Similar uncertainty applies to USB-C, which varies according to the underlying DisplayPort implementation.

WINNER:
DisplayPort and USB-C, but check your version.

Round 2

FEATURES AND EASE OF USE

We'll drop the suspense on this one, and declare the unambiguous winner: USB-C, of course. It takes everything DisplayPort can do up to version 1.4, and adds a whole slew of funky additional functionality. Firstly, it adds plain old USB data transmission, so you can use a single cable for video signals, and to drive a USB hub on your monitor. It also adds power, and critically in the downstream direction. That means you can use a single cable from a laptop to a monitor to have the former drive the video signal to the latter, and have the latter charge the former. Clever! It's also worth noting that USB-C is entirely reversible. You don't have to fumble around the back of a PC or display trying to orient the end of the cable correctly. It works both ways. As for the contest between DisplayPort and HDMI, it's probably a dead heat. Both support audio and video simultaneously. HDMI has the edge in terms of commonality—it's the interface of choice for consumer video products—while DisplayPort takes the prize for flexibility, thanks to its support for daisychaining multiple displays from a single output source socket (something USB-C also offers).

WINNER:
USB-C, easily.

Round 3

GAMING

So, you game a lot. But does it matter what video connection interface you use? That depends, mostly, on your display. If you have a pretty basic monitor with 60Hz refresh, modest native resolution, and nothing by way of features such as adaptive sync, it makes little difference. If you want to drive a VR headset with a single cable for power, video, audio, and control input, there's only one option: USB-C. In the middle, DisplayPort tends to be the best option for gamers, because of the greater bandwidth from DisplayPort 1.4. If you have, for instance, a 1440p monitor at 144Hz, both HDMI 2.0 and DisplayPort 1.4 have you covered. Up to 4K and 144Hz, however, only DisplayPort 1.4 will get the job done. Then there's adaptive sync and variable refresh rates. That includes Nvidia's G-Sync tech and AMD's simpler FreeSync. For now, DisplayPort is required to access these features, and thus improve the smoothness of your gaming, even at lower frame rates, while eliminating screen tearing. However, the upcoming HDMI 2.1 includes support for the VESA variable refresh rate standard.

WINNER:
USB-C for VR, DisplayPort is OK for everything else.

Left: USB-C takes the best of DisplayPort and adds some charging and USB awesomeness.

Middle: The interface of choice for TVs, HDMI is increasingly capable as a PC interface.

Right: DisplayPort is a pure-bred and purpose-built interface for the PC.

"If you're on a tight budget and you want a big beautiful 4K screen, for instance, an HDTV is not only a great solution, it may be your only option."

Round 4

PRODUCTIVITY

Getting things done makes different demands on your PC from gaming. So, what's best for content creation, work, and generally making things happen? In part, that depends on your budget. Larger screens with higher resolutions and greater dynamic range require more bandwidth, for instance. Right now, anything beyond 4K remains pretty niche. On the other hand, future-proofing is worthwhile, even if you can't afford the latest $3,000 8K display. If you're buying a new PC, something with a graphics subsystem that supports 5K-plus is worthwhile. After all, 4K monitors went from exotic to fairly affordable in just a few years. The same will probably happen with 8K within five years. Today, that means DisplayPort or USB-C, but with the caveat that you need to check what version of DisplayPort is supported in each case. DP1.4 is what you want to ensure support for future high-res displays. Of the two, USB-C has the edge. It gives the full DisplayPort experience, and adds USB functionality, plus the ability to charge and drive a display, all with a single cable.

WINNER:
USB-C.

Round 5

HDR

High dynamic range, or HDR, is the latest and hottest display tech. It also makes very particular demands of your display subsystem. The HDR10 standard includes 10-bit per channel color, so requires 25 percent more bandwidth than conventional 8-bit color. HDMI 2.0b does support HDR, but only up to 4K and 50Hz. For 4K at 60Hz over HDMI 2.0b, the chroma subsampling must be reduced slightly to reduce the bandwidth, which means you're not getting the full range of colors. HDMI 2.1 will deliver the full HDR10 experience at 4K and 144Hz, or higher resolutions with lower refresh rates, but HDMI 2.1 devices aren't quite here yet. As for DisplayPort (and USB-C), HDR support was added with version 1.4. That supports HDR at 8K and 60Hz using "visually lossless" Display Stream Compression, or HDR at 4K and 60Hz without any compression. So, as it stands, the current best DisplayPort implementation is superior to HDMI for HDR. The catch is that no new DisplayPort standard has been announced, while HDMI 2.1 will outstrip DisplayPort 1.4.

WINNER:
DisplayPort and USB-C now, HDMI later this year.

And the winner is...

The overall winner among today's display standards for the PC is clear. It's USB-C. It's the most flexible, feature-rich, and capable of the three main options. The ability to plug a laptop into a monitor with a single cable, and drive it at very high resolutions and refresh rates, at the same time as charging the laptop and enabling the connection of USB devices is very, very cool. USB-C is also perfect for next-gen VR gaming with a single cable. Even on the desktop, the simplicity implied by USB-C is a significant boon. Of course, remember that USB-C as a display connector is only as good as the DisplayPort interface underneath. Also bear in mind that this subject is something of a moving target. HDMI 2.1 has been announced, and should soon begin to appear in devices. It has the edge on DisplayPort 1.4, and thus USB-C, for outright bandwidth, if not overall features, so may be the better option for some edge cases with really high spec displays. Meanwhile, the upgrade path for DisplayPort, and its support for future cutting-edge PC monitors, is a little uncertain. ■

software

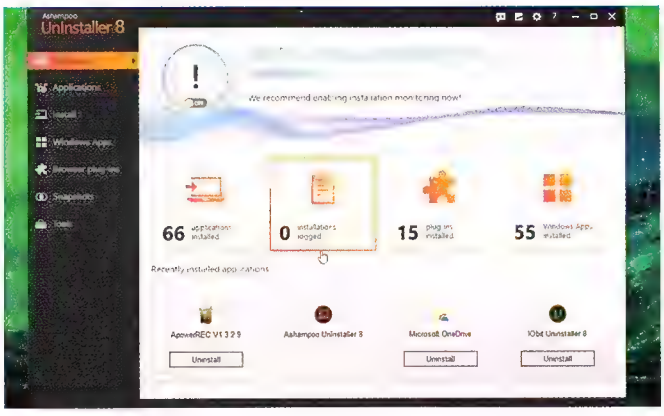
» APPS FOR ALL YOUR PLATFORMS

Windows SOFTWARE

Ashampoo Uninstaller 8

A premium software cleanup tool that monitors new installations and removes every trace of unwanted apps.

$50 | WWW.ASHAMPOO.COM



Uninstalling software can be a nuisance if you're relying on the Windows 10 'Add or remove programs' feature or a program's in-built uninstaller. Sure they'll do the job, but you're only able to uninstall one program at a time and the residual files, empty directories and old entries in the Windows Registry, leave a mess behind. These remnants might not take up much space by themselves, but over time that clutter accumulates and it can cause errors if you want to install a new version of the same software.

Ashampoo Uninstaller 8 is a software cleanup application that features several prominent upgrades. Most noticeable of these is a new overview screen, which now contains fewer statistics, letting you focus on the numbers that matter (say, for instance, the total number of applications and plugins installed on your PC). It's also enhanced the ability to automatically track changes to your PC so they can be easily reversed at a later date. Alternatively you can use this feature to create manual system images to return to particular point or count the size and number of additional applications you've installed since that point.

When you uninstall an application, the option to automatically perform a deep scan for residual files is selected automatically. After the software has been uninstalled, Ashampoo Uninstaller 8 will tell you how many files and registry entries are left over, and offer to delete them.You can also choose to have the files 'wiped' (overwritten with random data so they're impossible to recover), though this takes a little longer.

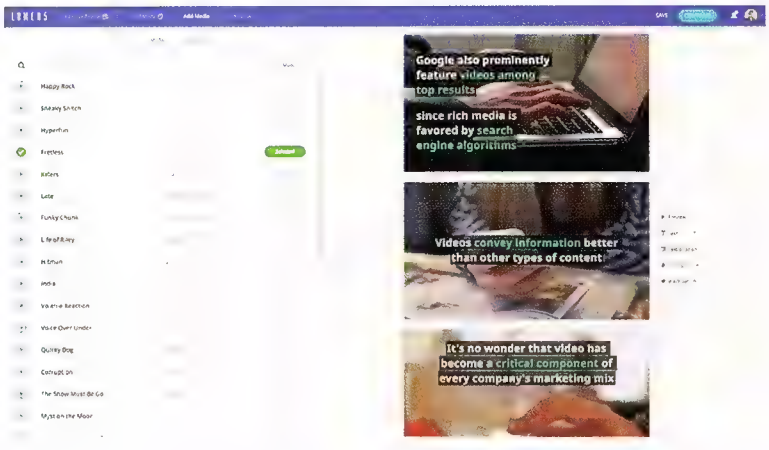
If your hard drive is getting full, a quick dip into Ashampoo Uninstaller 8 can help you see if there are any applications you could remove. Installed programs are split into categories, including recent installations, logged apps, large programs, and suspicious or poorly ranked software.

Ashampoo Uninstaller 8 is a superb software uninstaller, and will be a real boon for anyone who enjoys trying new programs and is tired of spending hours cleaning up afterwards. **Cat Ellis**

Lumen5 review

CREATING VIDEOS WITHOUT ACTUALLY EDITING VIDEOS. HOW IS THAT POSSIBLE?

FREE; US$49 PER MONTH (PRO) | LUMEN5.COM


Google also prominently feature videos among top results
since rich media is favored by search engine algorithms
Videos convey information better than other types of content
It's no wonder that video has become a critical component of every company's marketing mix

The people behind Lumen5 have thrown the traditional concept of video editing out the window for anyone wanting to quickly and easily make videos for social media. Lumen5 uses AI to turn a written article, press release or promotional copy into a short video compiled from an archive of stock video footage. The algorithm first highlights key information and presents this quoted text over a relevant video clip and background music.

Lumen5 will recommend the text it thinks will be best for the video, however you can manually alter the selection if you want a different message. The same goes for clip selection, where you'll be recommended clips that best fit the key text, with the option to further explore the full library of available scenes or upload your own. Other than this there's some basic options for transitions, clip trimming, text positioning and music selection, but you could just let the program choose all this itself. 480p resolution videos are available with a free sign-up and monthly subscriptions for for 720p or Full HD start at US$49 per month.. **Steve Paris** ■

techradar.
The home of technology
techradar.com

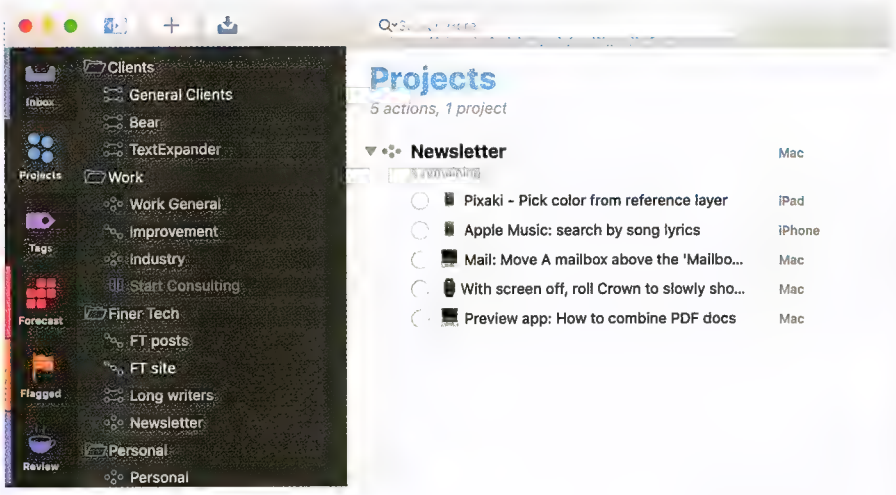
OmniFocus 3

Taking task management to task.

FREE | OMNIGROUP.COM

Over the years, OmniFocus has gained powerful tools for task and project management – some unrivalled in its field. OmniFocus 3 for Mac carries that torch even further, proving a worthy addition or alternative to the iOS version.

In OmniFocus 3, one of the largest changes is the retiring of rigid Contexts – a system of sorting tasks and projects into a single category – in favour of Tags. This allows for tasks to be sorted and surfaced in multiple situations, such as 'errands', 'work' and 'shopping list'. One of the core values of OmniFocus is being able to view tasks in multiple ways, so this opens up some doors.



Another major addition to this version is support for Omni Automation. This goes beyond AppleScript to support JavaScript, a more diverse and powerful system for automating OmniFocus.

Even in version 3, though, it feels difficult for new users to get started. While it does offer a little to familiarise new users, the developer could do more to help those who are new to the app. **David Chartier** ■

Roxio Toast 17

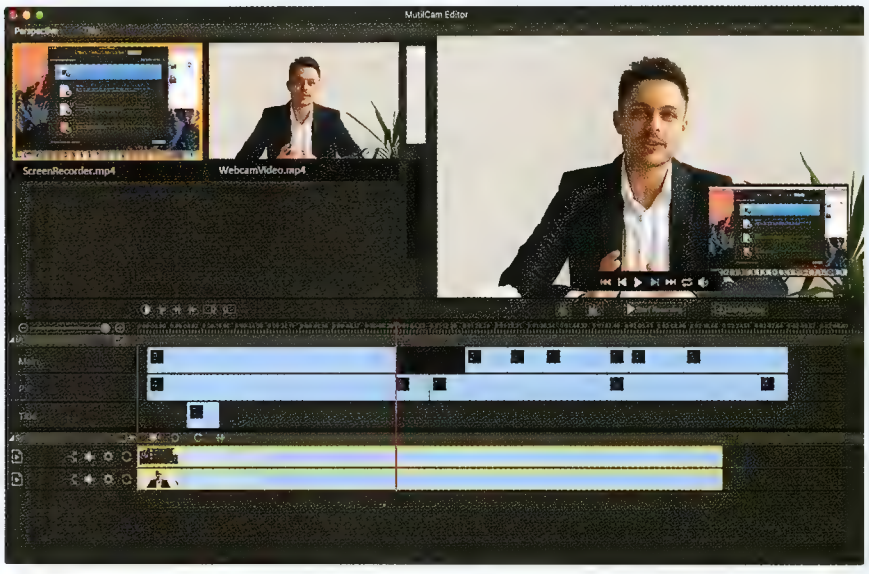
Recording app still burning bright

$99 (TITANIUM); $165 (PRO) | ROXIO.COM

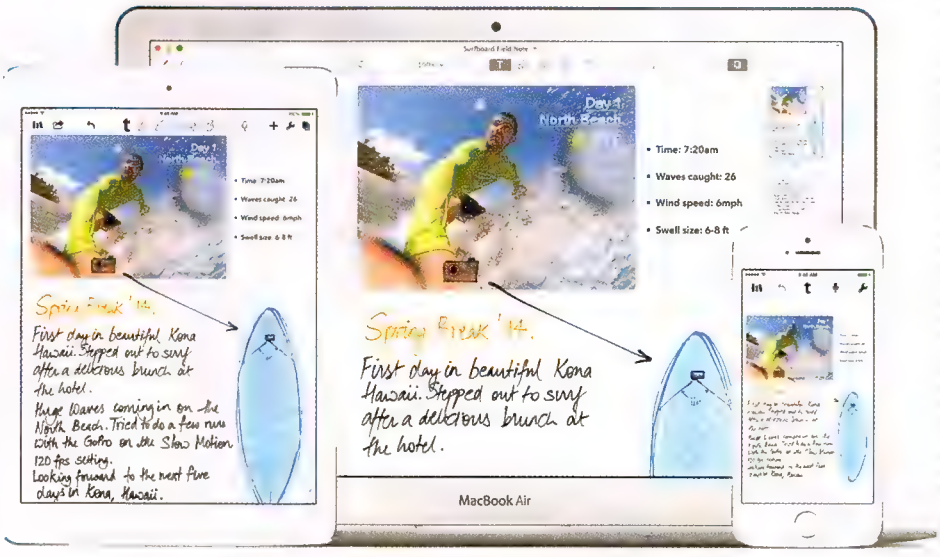
Burning optical discs may seem out of vogue, but Roxio is still making upgrades to its software.

Toast 17 can still author and burn CDs and DVDs (and Blu-rays with the $165 Pro edition); aside from the darker interface and a new internet-based installer, the app is largely the same. It is now 64-bit, though, making it feel faster, and resolving persistent lag when switching to the Video tab from Data, Audio, Copy, or Convert modes.

Toast is still not a proper successor to the late DVD Studio Pro in terms of pro authoring, although the bundled MyDVD allows for custom chapter stops and menus. MultiCam Capture makes it possible to create tutorials or training videos using FaceTime cameras, Mac displays and supported audio/video hardware.



The app now includes editing and titling capabilities for up to two streams; multitrack picture-in-picture and four streams are reserved for the Pro edition. You can't record multiple sources at once then assemble a finished video, but for editing live or adding extra content after the fact, Toast is more than capable. **JR Bookwalter** ■


Day 1 North Beach
Time: 7:20am
Waves caught: 26
Wind speed: 6mph
Swell size: 6-8 ft
Spring Break '14.
First day in beautiful Kona Hawaii. Stepped out to surf after a delicious brunch at the hotel.
MacBook Air

Notability

A near-perfect notes app.

$14.99 | FROM GINGER LABS, GINGERLABS.COM
NEEDS IOS 10 OR LATER

Notability is great for two kinds of jobs: creating notes and annotating docs. If you're looking for a reliable note-taking app that works with Apple Pencil, enables you to convert handwriting to searchable, editable text, imports PDFs, and syncs with the Mac app via iCloud, buy Notability.

You can input PDF, DOC, PPT files, text files, Excel spreadsheets, and images – the DropBox import is particularly handy. You can share in many ways, and drag and drop into other apps and between notes.

With PDFs, you can annotate, highlight, and copy content but you can't edit. You can group notes by subject or subject dividers, but can't repeat titles.

Notability's audio recording ability can be used to add voice notes to a doc. You can add annotations as you record and they'll appear at the right point during playback. You can then export a note in a zip file containing either a PDF or RTF file and your audio.

Handwriting recognition is superb even with a cheap stylus, but the app is elevated when using Apple Pencil. Text recognition is the icing on the cake for this brilliant app. ■

Carrie Marshall

Supertype

A new kind of word game.

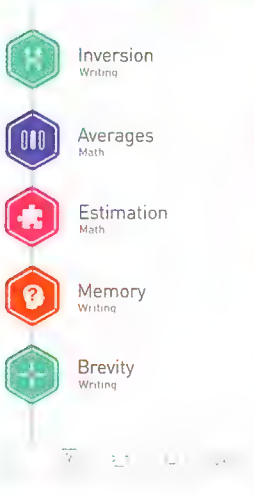
$2.99 | FROM PHILIPP STOLLENMAYER, KAMIBOX.DE
NEEDS IOS 8 OR LATER

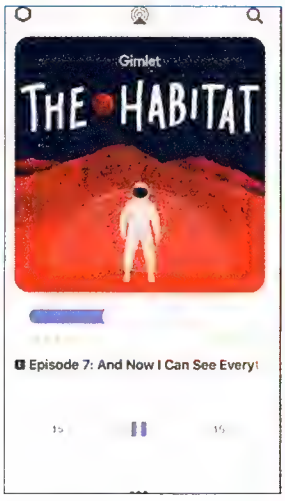
Supertype is a puzzle game that uses the power of letters. The levels are minimalistic, and it is up to you to work out how to use the letters in the English alphabet to collect the small square dots in each level. Perhaps it's about rolling an O down a gentle slope, or perhaps a more complicated setup where a P falls over to set off a domino effect with a bunch of lowercase Ls.

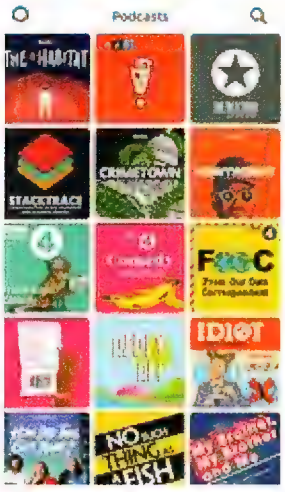
There are no in-app purchases, no timers to wait for, no ads to unlock new content. Some levels require you to merely touch the goal, others have more than one goal, requiring you to touch both at the same time. There are levels that have letters already written in, which need you to draw a single line to make the level work. The hardest levels are the ones where the goal seems impossible – perhaps it's under a block, and to reach it means hooking a C onto something and use it as a catapult for an E that's been pushed by a falling R.

You may find yourself looking at letters differently; realising that a Y lying down is just the right shape for an O to use as a ramp. It might ruin words for you forever, but at least you'll have fun while doing it. ■

Kate Gray







Cosmicast

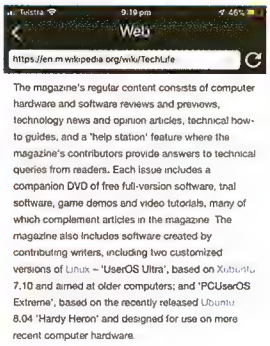
Pretty podcasting

$2.99 | N/A

Cosmicast is positioning itself as the most beautiful podcast player on the market, and while it's certainly a good-looking app with great visual customisation options, there are still some kinks it needs to work out before it can challenge the throne that Pocket Casts happily and comfortably occupies.

It's early days yet, but there's a general need for more polish – the search results are inconsistent (when I typed in 'Serial', the extremely popular podcast was the third one recommended), and there have been some instances of pages reloading repeatedly. Searchability is an issue in general, with some podcasts not appearing even when you type in their exact name, and figuring out how to navigate the app has posed some issues. Playback is smooth, though, and it's easy to build playlists or change the layout of your home page (you can make the tiles tiny and fill your screen with album art if you want). Hopefully Cosmicast will continue to improve, because it definitely is much more aesthetically pleasing than most of the other apps on the market. ■

James O'Connor


Web
https://en.m.wikipedia.org/wiki/TechLife
The magazine's regular content consists of computer hardware and software reviews and previews, technology news and opinion articles, technical how-to guides, and a 'help station' feature where the magazine's contributors provide answers to technical queries from readers. Each issue includes a companion DVD of free full-version software, trial software, game demos and video tutorials, many of which complement articles in the magazine. The magazine also includes software created by contributing writers, including two customized versions of Linux – 'UserOS Ultra', based on Xubuntu 7.10 and aimed at older computers; and 'PCUserOS Extreme', based on the recently released Ubuntu 8.04 'Hardy Heron' and designed for use on more recent computer hardware.

Focus – Speed Reading

15 seconds to read this review.

FREE | N/A

The average adult reading speed is 250 words per minute, which means that most of us are not reading as quickly as we could be. This might not be a problem for everyone, but if you've got a backlog of books and articles building up, some practice with speed-reading will help you get through it faster. Focus – Speed Reading will let you nominate how fast you'd like to read a web page or document, and then spit single words at you at the appropriate rate. It's surprising how readable a piece remains when you crank the speed up – you can go as high as 750 words a minute – and while it's not a great way to take in that new novel you've been looking forward to, it's an excellent method for skimming articles for work or classes to get most of the information very quickly. Hopefully, if you keep at it, it'll help develop your speed reading over time. The app doesn't play well with PDFs, unfortunately, but it supports document files and web pages.

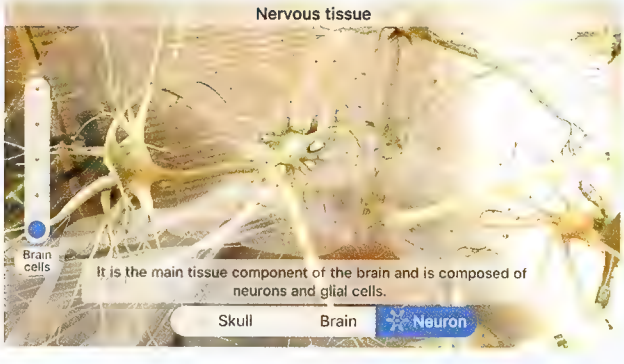
Brainapse

Brain training.

$2.99 | HTTPS://BRAINAPSE.EN.SOFTONIC.COM

Brainapse is an AR look inside your own head, an app that seeks to unlock the mysteries of the human brain. Apps like this are a good reminder of how inherently fascinating the human body is – exploring the various components of the human brain, from its individual parts to the synapses firing away inside it, guiding yourself through in augmented reality, is an idea with a lot of potential. The app has basic information about how the brain, and the skull, has evolved over time, and it's fun to poke around and superimpose skulls all over the surfaces of your house. As an educational tool, though, the app is lacking. There's not a lot of in-depth information provided on any part of the brain or its evolution, and navigating through the information that the app contains is cumbersome. It's a good proof of concept for the potential for AR in education, though, and if you find your own body fascinating then there's perhaps some value in Brainapse. ■

James O'Connor


Nervous tissue
Brain cells
It is the main tissue component of the brain and is composed of neurons and glial cells.
Skull
Brain
Neuron

Fedora 29

Mayank Sharma was expecting fireworks when Ubuntu switched to Gnome. Yet Fedora is still the undisputed premier Gnome-based distro.

FREE | WWW.FEDORAPROJECT.ORG

Fedora 29 is the first major Gnome-based distribution to be released this month. However, the two (Ubuntu being the other) have little in common besides their shared desktop environment. Fedora is the test bed for Red Hat Enterprise Linux's (RHEL). This is perhaps why it takes a more bleeding-edge approach than other desktop behemoths like Ubuntu. For instance, while Fedora 29 Beta runs on top of the Linux 4.18 kernel, the final release will be based on v4.19, which was undergoing testing at time of writing.

There are various other differences between the two. Unlike Ubuntu 18.10, Fedora Workstation 29 uses the Wayland display server by default. The release also uses the performance-enhanced Gnome 3.30 and gets all the improvements of the release as mentioned in the Ubuntu 18.10 review. The performance improvements are apparent when you do load-intensive tasks in the distribution while it runs on virtual hardware.

KEEPING THE GNOME FIRES BURNING

However, unlike Ubuntu 18.10, Fedora 29 aims to maintain the default Gnome experience. The most visible difference between the two Gnome 3.30-based distributions is the missing support for desktop icons in Fedora 29. This is because desktop icons were never part of the Gnome 3 design goals, and starting with v3.28 the developers decided to axe the six-year-old unmaintained code from the Nautilus file manager.

Ubuntu gets around the desktop icons issue by including an older version of Nautilus. On the downside Ubuntu misses out on all the enhancements in Nautilus 3.30, such as the new breadcrumb location bar, the integrated search bar, dynamic resizing and others. A Gnome Shell extension to display desktop icons that's under development will bring parity between both the distributions in this aspect.

EASIER APP INSTALLS

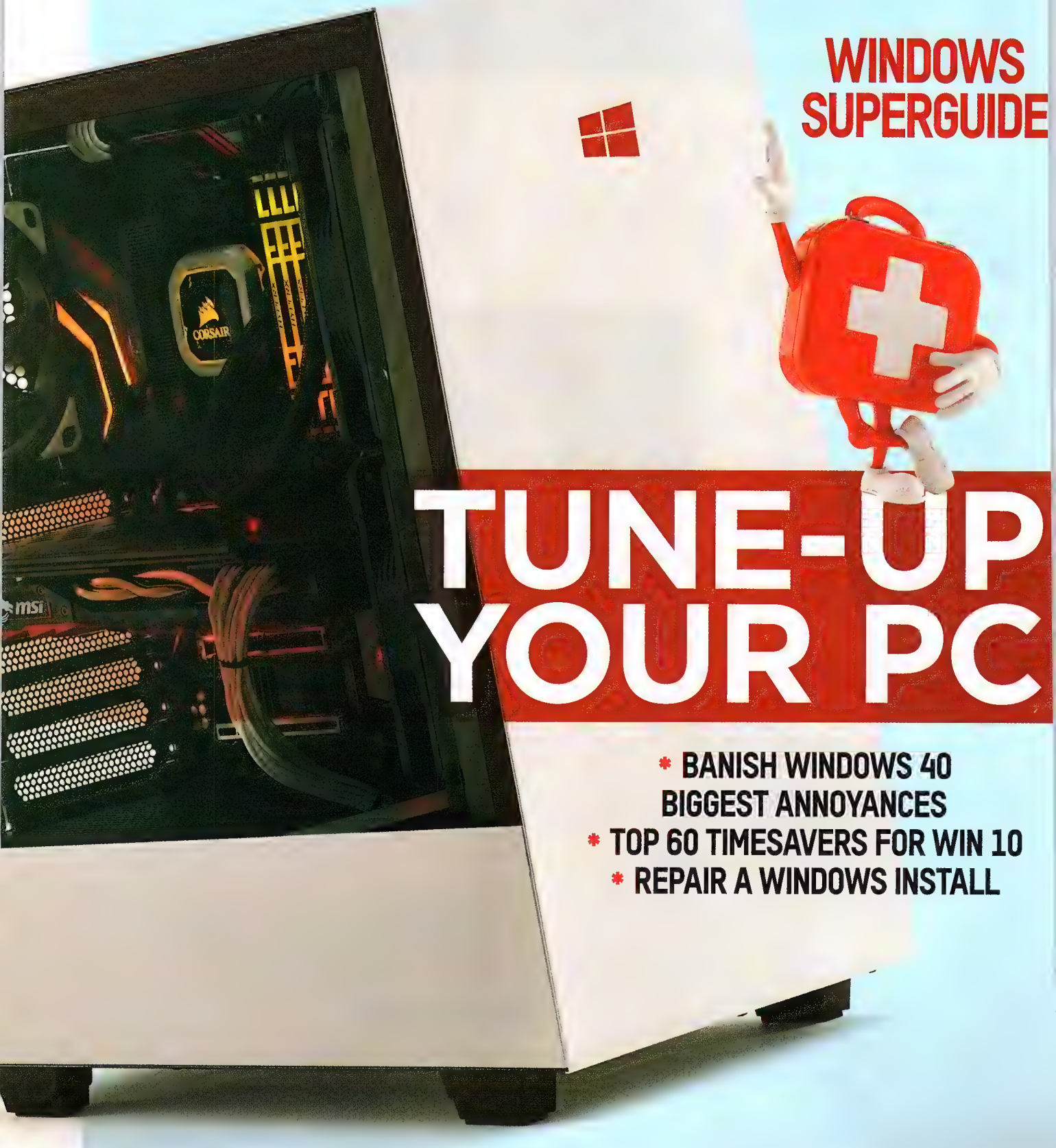
Another difference between the two distributions is their preferred choice of application virtualisation platforms. What Snaps are for Ubuntu, Flatpaks are for Fedora. Many Gnome programs, like Games, Recipes and the new Podcasts app, aren't even available in the official Fedora repositories and are instead meant to be installed as Flatpaks. You can install Flatpaks from the Software app after enabling support for Flathub. To this end, the Software app in Fedora 29 now enables you to automatically install updates for the Flatpak apps as well.

MODULAR REPOSITORIES

The interesting new development in Fedora 29 is the availability of modular repositories for Fedora flavours. The modularity concept was introduced in the previous release cycle, but only for the Fedora 28 Server edition. Modularity enables users to run multiple versions of the same software in isolated containers. This arrangement helps you use thoroughly tested versions of programs and libraries in production while you play around with their bleeding-edge versions, without worrying about one interfering with the other. Besides these, it's a fairly standard update with mostly incremental changes. If Fedora 29 is the only OS installed on the computer, GRUB will boot straight into it without displaying a boot menu. In addition, the overhauled GTK3-based Xfce 4.13 desktop is available from the official Fedora 29 repositories.

BETTER ON ARM CPUS

Going beyond the desktop, there's more to Fedora 29 than the Workstation edition. There's also Fedora Server and Fedora Atomic Host for hosting containers, which has now been rebranded as Fedora Silverblue. The developers also claim that Fedora 29 is also more ARM friendly than before. Enabling zRAM support for swap on ARMv7 will improve the distributions' performance and reliability on ARM devices with limited amounts of RAM such as the Raspberry Pi. ■



WINDOWS SUPERGUIDE

TUNE-UP YOUR PC

* BANISH WINDOWS 40 BIGGEST ANNOYANCES
* TOP 60 TIMESAVERS FOR WIN 10
* REPAIR A WINDOWS INSTALL

PAGE 49
TOP 60 TIMESAVING TIPS & TRICKS
Nick Peers collates no less than 60 tips, tricks and shortcuts to help Windows perform more efficiently.

PAGE 58
KEEP YOUR PC HEALTHY
Discover how to resolve some of the most annoying PC-related niggles and glitches known to man. Nick Peers is your guide.

PAGE 68
REPAIR A WINDOWS INSTALL
If you're trying to fix a problem, a refresh or repair install may be the best route to go down. Here's what you need to do.

Top 60 timesaving tips & tricks

Nick Peers collates no less than 60 tips, tricks and shortcuts to help Windows perform more efficiently.

One of the biggest bottlenecks holding back any PC is the person sat right in front of it. In a perfect world we'd all use our machines as efficiently as possible, learning best-practice techniques from the get-go, while avoiding bad habits.

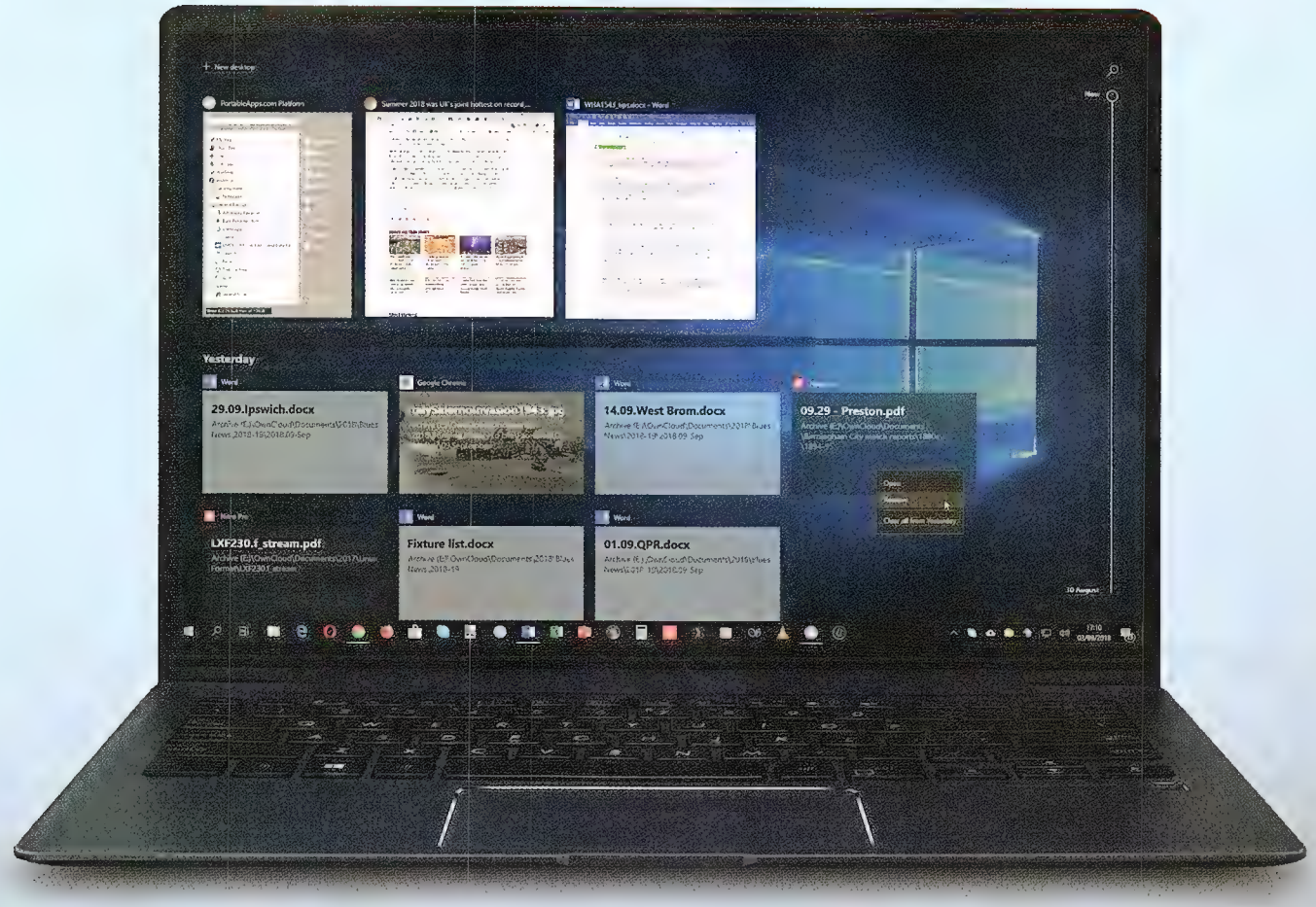
But, we're human, and the irony is that we make compromises in the short term to make things easier only for them to have the opposite effect in the longer term. But who wants to relearn everything from scratch? Instead, why not make one more compromise – one that will actually have benefits for you in the long as well as the short term?

That compromise is to work your way through the tips in this feature – you'll find 60 in the main copy, plus 40 additional shortcuts – and discover the tricks and techniques you need to successfully reduce the amount of time you spend carrying out specific tasks on your PC.

You'll find we've split things into four key sections: navigating the Windows desktop; mastering File Explorer; delving deep into your system; plus a collection of other tips and tools.

By the time you've reached the end of the feature, you will have hopefully discovered dozens of ways to speed up the way you use your PC – things that will free up your time so you can focus on the stuff you really bought your PC for – like staying in touch, streaming media or even researching your family tree. Let's get started, shall we?

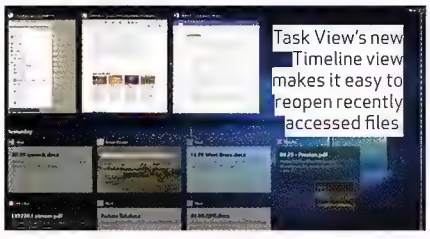
"By the time you've reached the end of the feature, you will have hopefully discovered dozens of ways to speed up the way you use your PC."



Desktop, Start menu and Taskbar

MASTER THE TIMELINE

The latest update to Windows 10 adds a new timeline slider to Task View – press Win-Tab to open it, then scroll down. Beneath the default view of your currently opened windows you'll find a grid-like view listing the files you've opened (as well as their parent apps). Click one to reopen it, or right-click for options to remove either that individual item or all entries from the same day.



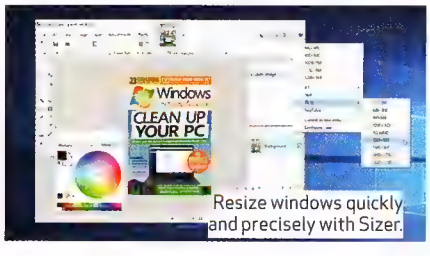
Task View's new Timeline view makes it easy to reopen recently accessed files.

USE MULTIPLE DESKTOPS

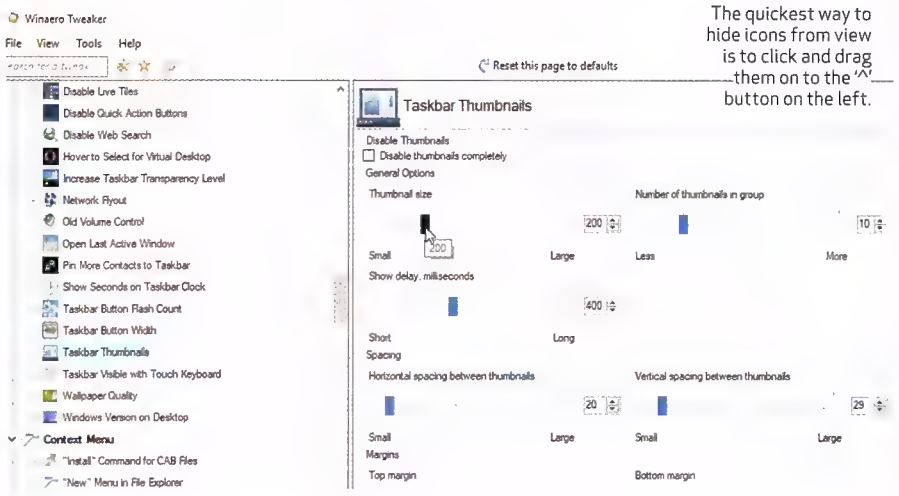
Task View is also where you can set up multiple virtual desktops – as many as your PC can handle – and then move program windows between them. You could set up one desktop for work, for example, and a second for all your media applications. Drag windows from here to a different desktop at the top of the screen to move the program to that desktop. Check out the box on keyboard shortcuts on the page opposite for some quick-fire ways to manage and navigate between your desktops.

SCROLL INACTIVE WINDOWS

Windows 10 has introduced an inactive window scrolling feature – simply move your cursor over an open window and use the mouse scroll wheel to scroll that window without switching focus from your main window – perfect if you're copying information from your web browser into a document, for example. If you don't like this new behaviour, disable it by flicking off the 'Scroll inactive windows when I hover over them' switch under Start › Settings › Devices › Mouse.



Resize windows quickly and precisely with Sizer.



The quickest way to hide icons from view is to click and drag them on to the '^' button on the left.

RESIZE WINDOWS QUICKLY

You'll know about Aero Snap – drag a window to either side of the screen and it'll resize to fit half the screen. Drag it into a corner and it'll resize to fit a quarter of the screen. But if you'd like to resize individual windows to specific sizes or aspect ratios, then install the free Sizer app (**www.brianapps.net/sizer4/**), which enables you to resize the currently active window quickly by pressing Ctrl-Win-Z, then selecting your chosen size.

HIDDEN 'SEND TO' SHORTCUTS

Right-click a file or folder and select Send To and you'll be able to send it to a specific location or device (such as Bluetooth or email recipient as an attachment). Hold the Shift key as you select Send To and you'll reveal loads more options, including many of your user folders. By default, items are copied to the new location; keep [Shift] held down to move them instead.

MORE SEND TO OPTIONS

Manage 'Send To' items via its own shell folder (type shell:sendto into the Run dialog box) where you can remove unwanted shortcuts plus add specific ones of your own. Alternatively, use Send To Toys (**www.gabrieleponti.com/software**) to add more useful entries such as transferring files or filenames to the clipboard, or an option to manually select the folder that you wish to send the item to.

TASKBAR APP CONTROLS

The Taskbar thumbnail feature that pops a preview of any open windows up when you roll your mouse over a Taskbar icon sometimes comes with useful extras – roll your mouse over the thumbnail and the window will momentarily appear on-screen for example. But look out, too, for app-specific controls such as Play/Pause and Track Skip buttons in Windows Media Player, for example. Customise the thumbnail feature further using the free Winaero Tweaker app (**https://winaero.com/download.php?view.1796**) – go to the Desktop and Taskbar › Taskbar Thumbnails section where you can disable the feature, tweak the size of thumbnails and more.

CUSTOMISE THE TASKBAR

Take the time to right-click the Taskbar where you can quickly tweak key features, such as the appearance of the search box (you can change it into an icon to free up space) plus choose whether to show the Task View button and add on-screen keyboard and trackpad buttons alongside shortcuts to the People bar and Windows Ink workspace if required.

MAKE USE OF JUMP LISTS

When you right-click certain app icons you'll see a list of recently opened files in that app – a handy way to quickly get going with a specific file again. If you frequently open the same files, roll your mouse over them in the list and click the Pin button to pin them to the top of the list. You can remove unwanted items from the list by right-clicking and choosing 'Remove from this list'.

TAME CORTANA

If you're a privacy fiend and don't need Cortana's personal assistant features, then convert it into a simple search box that simply searches programs, settings and files on your PC along with a few web suggestions. You could, of course, tweak the Registry to do this, but it's far quicker and easier to open Winaero Tweaker and tick Disable Cortana under the Windows Apps section. Reboot when prompted and the Taskbar's search box will be transformed.

ADD USER SHORTCUTS TO THE START MENU

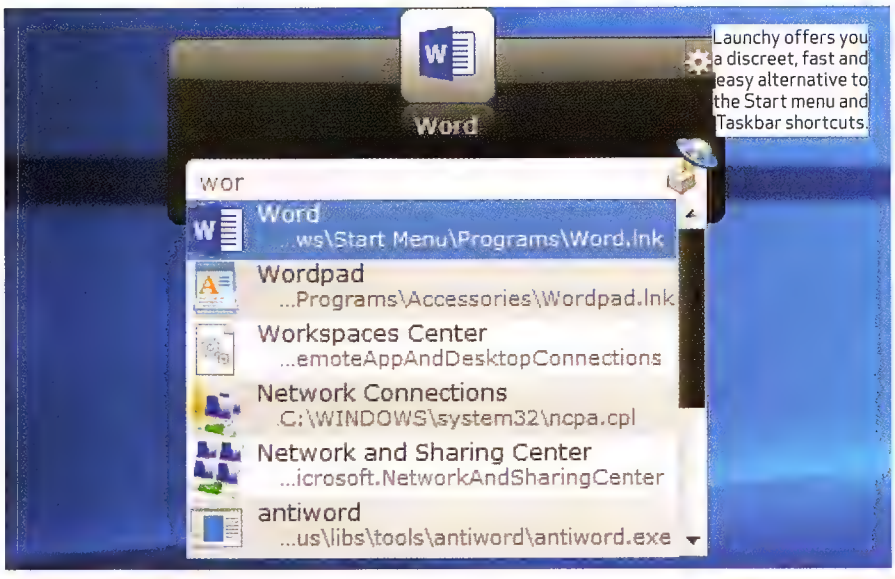
The Start menu's slide-out left-hand pane – click the three-line 'hamburger' icon to reveal it – contains shortcuts to useful features such as the log off/switch user menu (click your user picture to access it). You can add additional shortcuts to various user folders such as Documents and Music here by going to Start › Settings › Personalisation › Start and clicking 'Choose which folders appear on Start'.

ACCESS FILES FROM THE TASKBAR

Right-click the Taskbar and choose Toolbars › 'New Toolbar...'. You can select a specific folder or drive from here, or choose This PC to gain access to your entire filesystem. Once in place, click the '»' button next to the Toolbar name to browse through folders using pop-up menus.

CLEAN UP THE NOTIFICATION AREA

Once upon a time you had to delve deep into Settings to select which icons appeared in the Taskbar notification area, but these days the quickest way to hide icons from view is to click and drag them on to the '^' button to the left. You can also pin the icons hidden behind here so they're always visible in the Notification area by clicking '^' and then dragging them in the other direction. You can also rearrange the order icons appear in the list – click and drag them to their new location.



QUICKLY TOGGLE FOCUS ASSIST

Focus Assist is a useful setting that enables you to selectively mute alerts from the Action Centre at specific times. Set it up via Start › Settings › System › 'Focus assist', from where you can choose a scheduled time when it comes on and off, and choose whether to mute all alerts, just non-priority alerts – click 'Customise your priority list' to select which apps fall into this category – or everything except for any alarms that you have set.

Once set up, you can also toggle Focus Assist on and off manually by right-clicking the Action Centre notifications button in the bottom right of the screen and choosing what to allow (priority alerts or alarms) from the Focus Assist sub-menu.

TRY A DIFFERENT APPROACH

Can't get on with launching apps through the Start menu and Taskbar? Why not try Launchy (www.launchy.net) instead? This floating toolbar hides until required – press Alt-Space to bring it into focus – then start typing the name of the file, app or setting you need before pressing [Enter] when a match is found. Click the Settings button to customise its look, tweak preferences or add other folders for it to scan (such as a portable apps directory).

10 keyboard shortcuts

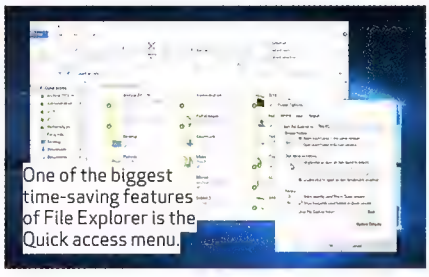
The following shortcuts also make use of the Windows key to help speed you round various parts of your system:

Shortcut	Triggers
Win-Ctrl-D	New blank desktop (press Win-Ctrl-F4 to close the current desktop)
Win-Ctrl-left/right arrow key	Move between multiple desktops
Win-.	Open the emoji picker in any text box (text editor, word processor, browser and so on
Win-Pause/Break	Open System Control Panel
Win-R	Open Run dialog box
Win-F	Open Feedback Hub and report issues to Microsoft
Win-E	Open File Explorer
Win-I	Open Settings
Win-M	Minimise all windows (press Shift-Win-M to bring them back)
Win-A	Open Action Centre

File Explorer

SAVE YOUR SEARCHES

The best way to search PC remains File Explorer's search bar – use the tools on the Ribbon's Search tab to help narrow results by file type, size and other properties. Recently used search terms remain available via the 'Recent searches' drop-down menu, but if you keep coming back to the same terms again and again, click 'Save search' to permanently store them. These searches are accessible from the Searches folder inside your user folder, but you can pin them to the Start menu for easier access (right-click a search entry to do so).



One of the biggest time-saving features of File Explorer is the Quick access menu.

CONFIGURE QUICK ACCESS

The 'Quick access' menu in File Explorer's left-hand Navigation pane is your best friend – pin frequently accessed folders here for quick access when needed by dragging them into place from the main File Explorer pane. Right-click a pinned folder and choose 'Unpin from Quick Access' to remove it. Recently accessed folders are displayed here by default, too. To see recently accessed files, click the 'Quick access' shortcut to view them beneath your pinned and recently accessed folders. To hide either from this view, right-click 'Quick access' and choose Options to untick unwanted elements.

ADD EXTRA ELEMENTS

By default, the Navigation pane shows 'Quick access', This PC and a handful of extras, such as OneDrive. You can add Libraries, Recycle Bin and Control Panel shortcuts by right-clicking blank space in the Navigation Bar and choosing 'Show all folders' – they will all appear under This PC.

SELECTIVELY PIN SHORTCUTS

If This PC now appears too cluttered, right-click and choose 'Show all folders' again to remove them. Now type shell:desktop into the Address bar and you'll see the items appear as standalone shortcuts – drag those you want across into the 'Quick access' menu to open them from there instead.

REMOVE UNWANTED ITEMS

Not everyone is a fan of OneDrive, so having its icon appear – along with other selected third-party cloud providers – in the Navigation pane may not be your cup of tea. If you can't find an option in the program's own settings to remove it from view, press Win-R, type regedit and press Enter. Next, press Ctrl-F, type system.ispinned and click Find Next. You'll find yourself somewhere inside the Computer\HKEY_CLASSES_ROOT\CLSID branch. Select the key and use the (Default) value on the right to identify it. If it's the one you want to hide, double-click the System.IsPinnedToNameSpaceTree value and change it to 0. The item will instantly vanish (change it back to 1 to restore it again). Repeat the search to find other unwanted entries.

SWITCH DEFAULT VIEW

When you open File Explorer from its Taskbar shortcut, it'll display your 'Quick access' folder by default. You can change the default view to This PC instead by right-clicking the 'Quick access' folder in the Navigation pane and choosing Options, then selecting This PC under 'Open File Explorer to:'. It's also possible to set the default folder to Downloads if you wish – you will need to use Winaero Tweaker (select File Explorer > File Explorer Staring Folder) in this event.

COLLATE FAVOURITE COMMANDS

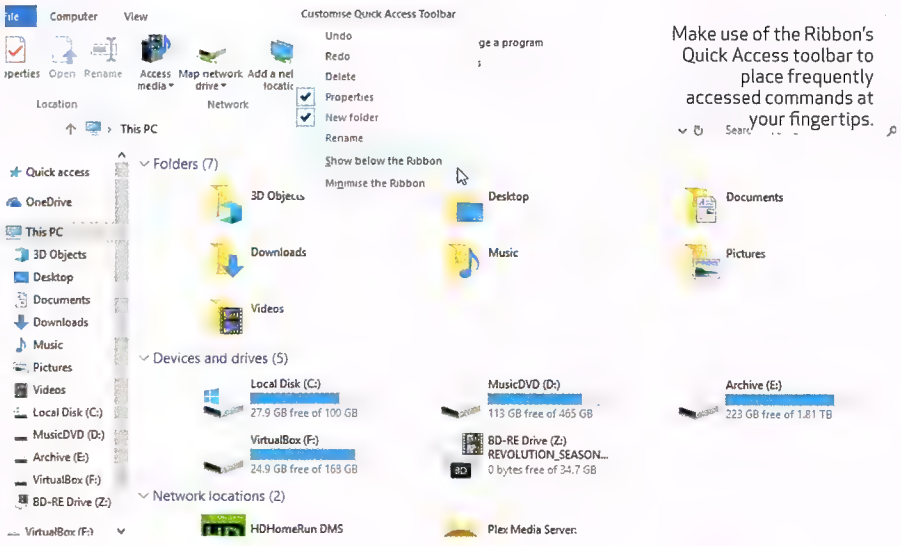
Like its contemporaries in Office and other applications, File Explorer's Ribbon features a Quick Access Toolbar in the top-left corner of the window, which enables you to 'pin' favourite commands from elsewhere on the Ribbon – these are always visible and easy to access. You can add common ones such as Properties, Rename or Delete by clicking the drop-down menu to its right, but you're not restricted to these options. Simply right-click your chosen command on the Ribbon and choose 'Add to Quick Access Toolbar'. If you run out of space, click the drop-down arrow next to it again, but this time choose 'Show below the Ribbon' to display all your commands in a toolbar beneath the Ribbon.

QUICK-FIRE CUSTOM VIEWS

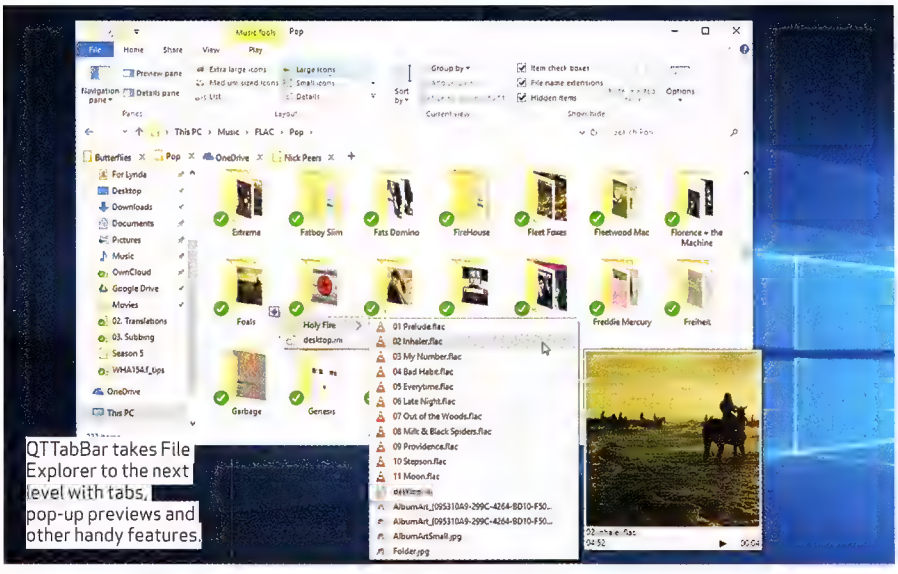
File Explorer makes it easy to view or hide hidden items, show file extensions and display tick boxes next to each item to make it easier to select non-consecutive items in a folder – you'll find these options grouped together in the 'Show/hide' section of the View tab on the Ribbon. You can even quickly hide selected items from view using the appropriately titled button.

BULK ACTIONS

Fed up with performing the same repetitive action on a group of files one at a time? With 'Item check boxes' selected, you can perform certain actions across any currently selected files with one click. Universal actions such as Rename, Delete, Attach To Email or Compress To Zip File can be found on the Home and Share tabs (but check the box at the end of the feature for a better bulk-renaming tool). If you select a group of photo files you can also rotate them all 90-degrees clockwise or counter-clockwise under the Picture Tools > Manage tab.



Make use of the Ribbon's Quick Access toolbar to place frequently accessed commands at your fingertips.



QTTabBar takes File Explorer to the next level with tabs, pop-up previews and other handy features.

HIDE THE RIBBON

While it's possible to hide or show the Ribbon using the '^' and 'v' buttons in the top right-hand corner, it's just as quick – if not quicker – to simply double-click a Ribbon tab header, which does the same thing. To temporarily view a tab's contents without bringing the whole Ribbon back into focus, just click on it once – it'll vanish when you next click away from it.

CUSTOMISE BY FOLDER TYPE

Do you find yourself having to tweak the view settings of specific folders based on their contents? You can designate certain folders as a specific type (General, Documents, Pictures, Music or Videos) by right-clicking inside the folder and choosing 'Customise this folder...' Once done, you can further customise how the folder appears via the View tab on the Ribbon. If you'd like to apply the same settings to other folders of the same type for a more consistent look, click Options > 'Change folder and search options' > 'View tab' and click 'Apply to Folders'.

QUICK-FIRE SHARED FOLDERS

The quickest way to share a folder is to right-click it and open the 'Give access to' sub-menu. From here you will be able to share it with other users of your computer – however, you should ignore any Homegroup options as Microsoft has now deprecated this feature.

Choose 'Specific people' if you are only planning to share the folder with yourself or wish to share with additional people (such as the 'Everyone' user, which gives universal access without the need for a password).

ADD TABS TO FILE EXPLORER

Anyone who regularly has two or more File Explorer windows open will love this next tip: download and install QTTabBar from **http://qttabbar.wikidot.com/** and it'll integrate itself with File Explorer, enabling you to browse multiple locations through a series of tabs once you select QTTabBar from the Options menu under the File Explorer Ribbon's View tab. You'll see the tabs at the top of the screen – press Ctrl-N and a duplicate tab of the current one will appear beneath the Address bar or click the '+' button to select a new location manually. You can copy or move files between different tabs by dragging them from the current window on top of another tab, or by right-clicking the tab for more options.

QTTABBAR EXTRAS

QTTabBar comes with two handy extras – pop-up previews of supported formats (music, video, and image) when you roll the mouse over an item, plus look out for a small down arrow icon that appears when you roll the cursor over a folder – click this and you'll be able to view (and browse to) content inside that folder, too.

GAIN AN APPLICATION LAUNCHER

QTTabBar can be expanded in other ways, too: select QT Command Bar to unlock a host of extras – customised folder groups for easy access, plus clickable buttons to recently accessed folders and files. There's also a greyed-out application launcher button – simply drag a program shortcut on to here to add it. To manage your apps – including adding a keyboard shortcut – right-click to the right of the toolbar and choose QTTabBar Options > Application launcher.

10 system folder shortcuts

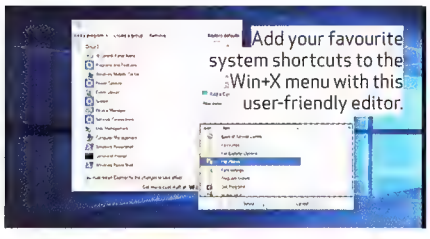
Press [Win] + [R] or type the following shortcuts into the Address bar in File Explorer to quickly jump to the hidden folders listed:

Shortcut	Points to
shell:sendto	The SendTo folder, which appears when you right-click a file or folder
shell:recent	The Recent Items folder, containing both file and folder shortcuts
shell:fonts	The Fonts folder
shell:common startup	Startup folder as found in the Start menu
shell:libraries	Open the Libraries folder
shell:user pinned	Access shortcuts pinned to the Start menu or Taskbar
%appdata%	The hidden Application Data/Roaming folder where many program settings are stored
%localappdata%	The hidden Application Data/Local folder
%userprofile%	Your personal user folder where most of your data is stored
%windir%	The Windows folder – typically C:\Windows

Speedy access to system tools

CREATE AND CUSTOMISE AN ALTERNATIVE START MENU

The menu that appears when you right-click the Start button or press Win-X – confusingly named the Quick Access Menu – contains quick shortcuts to various parts of your system, but you're not limited by the default choices. It's possible to customise the menu to your tastes so the shortcuts you want – whether to programs, system tools or more – are just a couple of clicks away. Download and run the free – and portable – Win-X Menu Editor tool from **https://winaero.com/download.php?view.21** to add and remove tools, as well as to rearrange the menu order.


Add your favourite system shortcuts to the Win+X menu with this user-friendly editor.

CREATE A GODMODE SHORTCUT

The GodMode shortcut is so-named because it provides one-click access to the entire Control Panel – and, given Microsoft's slow deprecation of the Control Panel in favour of Settings, it's the best way to keep quick and easy access to the older (yet still useful) system tool. Right-click the desktop and choose New > Folder, then change its name to: GodMode.{ED7BA470-8E54-465E-825C-99712043E01C}

Feel free to change GodMode to whatever you like before clicking OK. You can now double-click the icon to access all Control Panel applets via a handy A-Z list.

CREATE CUSTOM CONTROL PANEL SHORTCUTS

GodMode gives you access to all of the Control Panels, but if there's one applet you still use more than others – for example, the additional controls found under File History – then why not create a shortcut directly to that instead? Right-click the desktop or target folder and choose New > Shortcut, then type the following exactly into the new shortcut box: %WinDir%\explorer.exe shell:::{F6B6E965-E9B2-444B-9286-10C9152EDBC5}

Click 'Next', name your shortcut and click Finish to create it, then double-click this to bypass the File History entry in Settings. Other Control Panel applets are easier to create – see the box on the opposite page for just ten of our favourite shortcuts.

SWITCH DEFAULT APPS

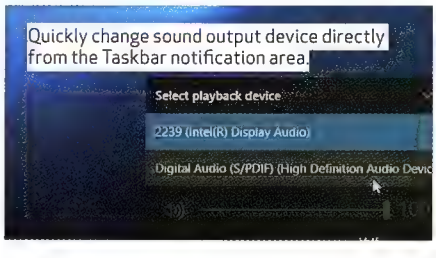
Wrong program hijacked your file extensions? Instead of double-clicking a file, right-click it and choose 'Open with' > 'Choose another app'. Make sure you tick the 'Always use this app…' box before selecting your alternative from the choices on offer (click 'More apps' for a wider choice and scroll down and pick 'Look for another app on this PC' if your desired app hasn't been detected).

CHANGE THE DEFAULT PRINTER

If you have two or more printers and you tend to switch between them infrequently, there's little sense in making one the default over the other. Instead, navigate to Start > Settings > Devices > 'Printers & scanners', then scroll down and tick 'Allow Windows to manage my default printer'. Windows will now select whichever printer you last used as your current default.

EASILY SWITCH WINDOWS FEATURES ON OR OFF

Want to get rid of unused features like Microsoft's XPS Document Writer, IE11 or even Windows Media Player – or looking to add features like Hyper-V virtualisation support? You need to access the Windows Features dialog box, buried away under the Programs and Features Control Panel. Save time by accessing it directly: press Win-R, type optionalfeatures and click OK.


Quickly change sound output device directly from the Taskbar notification area.
Select playback device
2239 (Intel(R) Display Audio)
Digital Audio (S/PDIF) (High Definition Audio Devic

SWITCH PLAYBACK DEVICE

Lost your sound? Want to switch between headphones and your monitor's speakers? The quickest way to change the sound output device is to click the volume icon in the Taskbar notification area, then click '^' to select your chosen playback device from those in the list. If it's not listed, right-click the icon instead and choose 'Speaker setup' > 'Advanced set-up' to access the old-style Sound Control Panel.

WHERE IS THE ACCESSORIES FOLDER?

Click 'Start' to browse the program list for those classic accessories – Notepad, Clipping Tool, Character Map and so on – and you'll be left floundering. The reason is Windows 10 has renamed the folder Windows Accessories, so they're at the bottom of the list. Remember, it's just as quick to type the target program directly into the search box to locate it than manually scrolling through the list – and that applies to most programs.

SHORTCUTS TO ADMIN TOOLS

The Computer Management console is the place to go if you're looking for a variety of core system tools – Device Manager, Services, Disk Management, Task Scheduler and Event Viewer all reside here, for example. All the tools reside in the C:\Windows\System32 folder and have a .msc file extension. You can access Computer Management via the Win-X menu, or type compmgmt.msc into the Start > Run box. Each tool has its own direct shortcut, too, such as devmgmt.msc, services.msc and eventvwr.msc, which can also be pinned anywhere.

GET QUICK ACCESS TO YOUR PC'S DISK MANAGEMENT TOOLS

Traditionally, the Disk Cleanup and Disk Defragmenter tools are triggered from shortcut buttons on a specific drive's Properties window. Save a bit of time by going through Start > Run instead – type cleanmgr to launch the former, and dfrgui for the latter. Type diskmgmt.msc to launch the Disk Management tool for viewing and partitioning drives.

UNINSTALL IN BULK

Windows' tools for removing apps work on the premise you'll uninstall one at a time. They also leave loads of detritus behind. Instead, Install IObit Uninstaller 8 Free (**http://www.iobit.com/advanceduninstaller.php**) and not only can you have the program scan for leftover files and Registry entries, you can also go through your entire program list, place a tick next to each app you

want to remove and then click Uninstall to install them one after the other. You'll need to pay attention to the uninstall process – decline any prompts to reboot until everything's been removed, plus click through various dialog boxes that may pop up. Nevertheless, it's still far quicker than Windows.

COPY AND PASTE TO THE COMMAND PROMPT

Open a command prompt window and you can manually – and laboriously – copy and paste commands within and from outside the window using the mouse and a right-click. Speed things up by enabling the Ctrl-C and Ctrl-V keyboard shortcuts – right-click on the program toolbar and choose Properties › Options tab before ticking 'Enable Ctrl key shortcuts'.

REGISTRY SHORTCUTS

Registry Editor gets increasingly powerful with each new Windows feature update, but some of these shortcuts work in older versions, too. First, it's common to accidentally go down the wrong branch (HKEY_CURRENTUSER or HKEY_LOCAL_MACHINE) where many keys are duplicated. If you find yourself in this situation, simply right-click the key and if there's an equivalent at the other branch, you'll see something like 'Go to HKEY_LOCAL_MACHINE' enabling you to quickly jump to it.

Also make use of the Favourites menu should you often return to a specific Registry key. If you have the latest version of Windows you can also make use of the new Address bar – simply copy a Registry key from a website or document and then paste it into here to jump straight to the location in question.

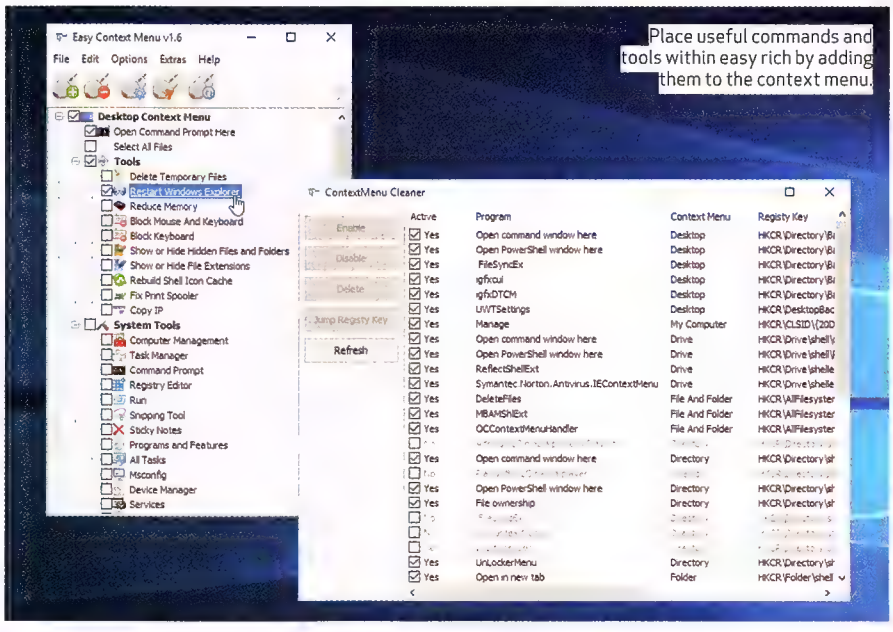
POWER UP THE CONTEXT MENU

Lots of useful shortcuts can be found by right-clicking files and folders, but over time the menus can become cluttered – and yet still lack the options you really want. Easy Context Menu (**www.sordum.org/7615/**) fixes both problems. The program's main screen splits available options into six main categories based on what you're right-clicking (from the desktop to drives, folders or files), with three sub-categories in each offering loads of useful shortcuts.

Once you've selected your choices, click the Context Menu Cleaner button to go through all the context menu entries added by third-party programs. You can disable or even delete unwanted entries to cut the clutter.

FIND MORE SHORTCUTS

We've highlighted plenty of keyboard and system shortcuts in this feature, but we've barely even begun to scratch the surface of what's available. Luckily, a handy reference guide can be found at **https://shortcutworld.com** – head there in your favourite web browser, then select Windows Shortcuts on the left and you'll see an extensive list covering what appears to be just apps. Click 'Windows built-in Apps' under the Group section and you'll find sections covering the command prompt, Run dialog box, and File Explorer as well as built-in Windows apps.



10 Control Panel shortcuts

Want access to deep parts of the Settings app instead? Visit **https://msdn.microsoft.com/mt228342.aspx** for a complete list:

Shortcut	Points to
shell:appupdatesfolder	Display installed Windows Updates
shell:searchhomefolder	Open the File Explorer search tool
control appwiz.cpl	Open Program and Features Control Panel
control date/time	Open Date and Time Properties window
powercfg.cpl	Open Power Options Control Panel
intl.cpl	Access Regional Settings Control Panel
control mouse	Open Mouse Properties Control Panel applet
control sysdm.cpl,,4	Open System Protection tab (System Restore)
control printers	Open Devices and Printers Control Panel
control userpasswords2	Access hidden User Accounts dialog

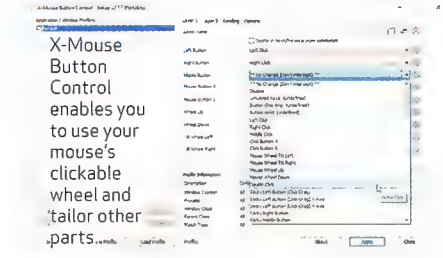
Miscellaneous shortcut tips

UNIVERSAL KEYBOARD SHORTCUTS

We're not talking about the well-known shortcuts you should have mastered such as Ctrl-C (copy), Ctrl-X (cut) and Ctrl-V (paste) – instead, it's making use of the Alt key. Press Alt and look out for underlined letters on menus – press this letter and that option will be selected (or menu opened to reveal more shortcuts). But Alt also works with the Ribbon – press it and you'll see a list of keys to press to activate specific tabs or features.

TAKE CONTROL OF YOUR TOUCHPAD OR MOUSE

Are you taking full advantage of your mouse or keypad? Try running X-Mouse Button Control (www.highrez.co.uk) to take full control of your mouse – including the middle mouse button. If you're using a touchpad, check you've installed the latest drivers from the manufacturer, then access the old-style Mouse Control Panel (see the 'Control Panel shortcuts' box on the previous page) and look for a specific tab where its features reside. If your touchpad supports gestures, for example, you can speed up the way you navigate your PC.



X-Mouse Button Control enables you to use your mouse's clickable wheel and tailor other parts.

TIGHTEN PRIVACY QUICKLY

Windows 10 doesn't have a great reputation for privacy, but if you're confused by all the different options out there simply download and run the free portable O&O ShutUp 10 (**www.oo-software.com/en/shutup10**), which can do all the hard work of choosing the appropriate settings for you – or you can go through each setting individually, get an explanation, and decide if you want to disable it or not.

GROUP WINDOWS TOGETHER

How much time do you lose to switching between open windows on the desktop? TidyTabs (**www.nurgo-software.com**) is our go-to program for tabulating open program windows together just like in your web browser. You can mix and match different programs together – for example, grouping related apps together – and easily switch between, rearrange and add or remove individual programs from a tab group. The free program has a few restrictions, but an upgrade to the Pro version costs just US$9, with bonus features including the ability to automatically group open windows from the same program together.

CREATE CUSTOM SHORTCUTS

Want to assign your own keyboard shortcuts to programs? If the Alt-Ctrl shortcuts available by right-clicking a program's shortcut and choosing Properties don't appeal, try WinHotKey (**https://directedge.us/content/winhotkey**) instead. It utilises the Win key as its primary trigger, and while most of the basic ones (such as Win-X) have been taken by Windows, you can pair it with other key combos – Shift, Alt or Ctrl – to create as many additional shortcuts as you need. It'll work with folders and documents, too.

BYPASS THE LOGIN SCREEN

If you're the only user of your PC, and it's kept in a secure location, save time when you start Windows by bypassing login. Press Win-R, type netplwiz and press [Enter]. Make sure your user account is selected from the list, then untick 'Users must enter a username and password to use this computer'. Click 'Apply', enter your password twice when prompted, then click OK and reboot to test. Re-tick the box if you want to restore the default behaviour.

SEARCH YOUR PC QUICKLY

Windows' indexed file searches are swift and great – but only if the folders in question have been indexed. If all you want to do is perform a quick search for a specific filename or folder, then WizFile (**https://antibody-software.com**) is the tool you need, producing results almost instantaneously across entire drives, not just those that have already been indexed by Windows.

MOVE PROGRAMS SAFELY TO ANOTHER DRIVE

Running out of drive space? It's possible to move certain Microsoft Store apps to your data drive to free up space – go to Start > Settings > Apps and work through the list, clicking each app in turn to see if a Move button is available; if it is, click it and choose your alternative drive.

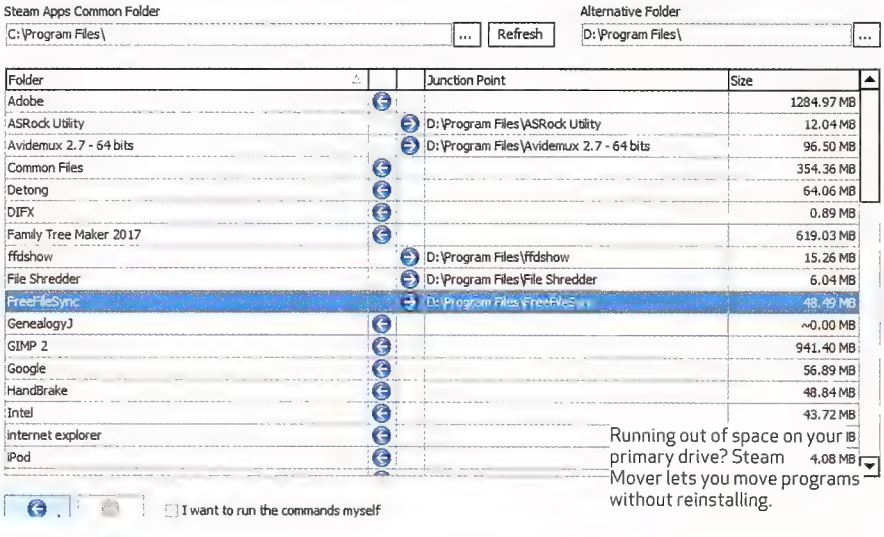
Most programs won't fall into this category, but rather than uninstall and reinstall them, use SteamMover (**www.traynier.com/software/steammover**), which cleverly moves your files then creates special links so that Windows still thinks the program resides in its original location, enabling it to continue working seamlessly. Remember to run the program as an administrator – it won't work otherwise.

AUTOMATE DRIVE CLEANING

Fed up with having to manually go into Disk Cleanup to keep your drives relatively free from clutter? Navigate to Settings > System > Storage and flick the Storage Sense switch to On to have Windows automatically clear out temporary files (and Downloads) after a set interval as well as periodically empty the Recycle Bin. Control how it performs by clicking 'Change how we free up space automatically' where you can also perform a manual cleanup, too.

BYPASS ITUNES

Think the slow and ponderous iTunes is the only way to transfer music to and from your iPod or iPhone? Think again. Download CopyTrans Control from **www.**



Running out of space on your primary drive? Steam Mover lets you move programs without reinstalling.

Ditch iTunes in favour of a slicker, quicker tool for transferring music to and from your iPhone, iPod and iPad.

copytrans.net/download/ – once launched, click Install next to the free CopyTrans Manager utility. Plug in your iPhone or iPod and if iTunes hasn't been installed already, the program will offer to download the core drivers you need – basically the Apple Application Support and Apple Mobile Device Support packages – and then you'll be able to use CopyTrans Manager to sync music to and from your device quickly, easily, and painlessly.

UNIVERSAL AUTOCOMPLETE

Autocomplete is one of Word's best features for speeding up the way you type, but why restrict it to Word? Install and run the free Texter app through **https://portableapps.com/** and you can build a library of text snippets complete with abbreviations and – crucially – a trigger key such as Tab so the full text is only inserted when you specifically want it. These so-called 'Hotstrings' can be plain text or include special operators such as %c (insert text from the clipboard at this point) and %|, which places the cursor at that point in your replacement text after it's been inserted.

A MORE POWERFUL CLIPBOARD

It can be time-consuming copying and pasting text from multiple sources – so install or run Ditto (**https://ditto-cp.sourceforge.io/**) and you can save individual clipboard items – whether text, image, HTML or some other custom format – to paste again in future without having to first track them down and copy them back to the clipboard. You can even sync your saved clipboards over the network for sharing securely on other PCs.

GET WINDOWS PHOTO VIEWER AND MAKE IT THE DEFAULT

One of Microsoft's worst decisions was to retire Windows Photo Viewer in Windows 10 in favour of the bloated, clunky Photos app. Thankfully, it's not yet physically removed the tool, simply 'hidden' it, and you can get it back through Winaero Tweaker via Classic Apps > Activate Windows Photo Viewer.

Once done, the app will appear as an option under Start > Settings > Apps > 'Default apps' where you can make it the default photo viewer once more.

REBOOT QUICKLY TO SAFE MODE

So you need to boot into Safe mode? Avoid the convoluted path through Settings – instead, press Win-R, type msconfig and press [Enter], then switch to the Boot tab, tick 'Safe boot' and choose Network to retain access to the network if necessary. Click 'OK' and reboot – you'll go straight into your choice of Safe mode. To come back again, return to msconfig and untick 'Safe boot' before clicking OK and rebooting your PC.

CREATE SAFE MODE SHORTCUTS

The above technique works best for occasional forays into Safe mode, but if you want an even quicker way to reboot into Safe mode, then head into Winaero Tweaker's Shortcuts section and plump for the Safe Mode Shortcuts option. Choose which Safe mode shortcuts to create – Normal, With Network or 'Safe mode with command prompt' – alongside the obligatory Normal shortcut (you'll need this to return to Windows proper), chose where to place them and click the button to create the shortcuts, ready for use.

10 Bulk-processing tools

These free tools let you convert or make changes to a group of files with just a few clicks

Shortcut	Points to
Advanced Renamer	Rename files quickly (**www.advancedrenamer.com**)
Image Resizer for Windows	Quickly resize images files via the right-click menu (**www.bricelam.net/ImageResizer/**)
FastStone Photo Resizer	Resize, convert and edit images in bulk (**http://faststone.org/**)
Handbrake	Convert and process movies using presets and manual controls (**https://handbrake.fr**)
Pazera Free Audio Extractor	Extract audio from video (**www.pazera-software.com/products/audio-extractor**)
MP3tag	Apply metadata to music and movie files in bulk (**www.mp3tag.de/en/**)
Calibre	Bulk convert e-book formats, including EPUB and PDF (**https://calibre-ebook.com**)
MultiDoc Converter	Convert text and word processing formats (**www.multidoc-converter.com**)
Duplicate Cleaner Free	Find and delete duplicate files (**www.digitalvolcano.co.uk/duplicatecleaner.html**)
ArcConvert	Convert compressed file archives (**https://sourceforge.net/projects/archivconvert/**) ■

KEEP YOUR PC HEALTHY

Discover how to resolve some of the most annoying PC-related niggles and glitches known to man. Nick Peers is your guide.

You could say that if there's one thing Windows is guaranteed to be good at, it's annoying people. With each new release comes a host of new features, while existing features get dropped or moved somewhere obscure. Then there's the frustrating problems caused by glitchy hardware or misbehaving apps, never mind the shortcomings of the Internet and the questions of security and privacy.

We've rounded up over 40 of the biggest annoyances we've come across in the years we've been running Windows. We've dug out workarounds and fixes, and found ways to restore missing features. We've focused on those niggles that have most universal appeal, and made sure our solutions are easy to follow.

We cover everything from fixing sound-related problems to playing DVDs and Blu-rays in Windows for free. Discover how to put Cortana back in her place and get rid of unwanted built-in Windows apps (while restoring useful features, such as Windows Photo Viewer). It's all here – and more.

CORSAIR
HYPERX
HYPERX
HYPERX
HYPERX
GIGABYTE
X470 AORUS GAMING 7 WIFI
msi
CORSAIR
USB3.0

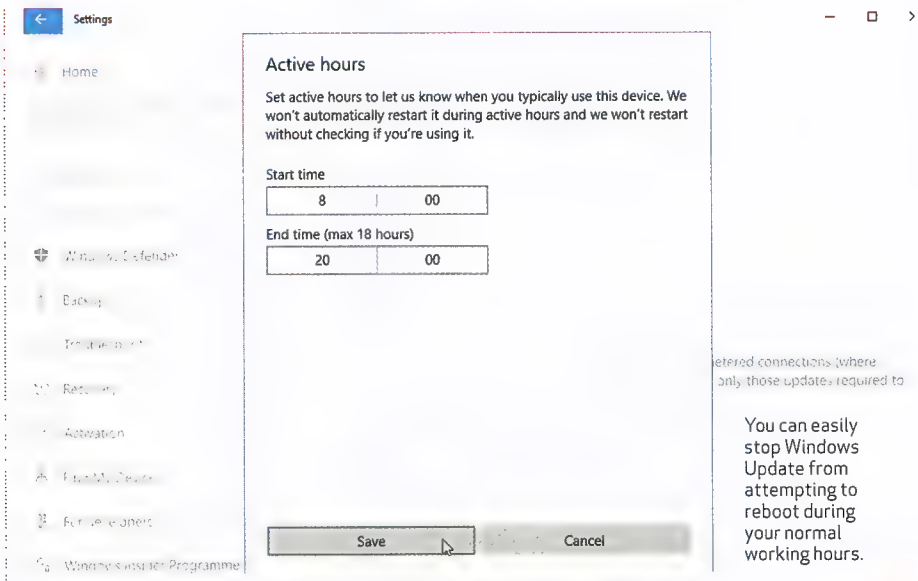
Fix Windows problems

The following tips and tricks will help you restore missing features, as well as curb some of Windows 10's more annoying habits.

Let's start by checking that System Restore is enabled (it's switched off every time Windows 10 performs a major update). Type system restore into Cortana's search box and then choose 'Create a restore point'. Check your system drive – if it's off, select it and click Configure... Choose 'Turn on system protection', then set the slider to 5GB or five percent of available space before clicking OK.

Worried that Windows Update might suddenly attempt to reboot without warning while you're using your PC? Click Settings > 'Update & security' and choose 'Change active hours' under Windows Update. Set your start and end times – and Windows Update won't automatically restart during these hours. While you're here, select Advanced Options > 'Choose how updates are delivered', then select 'PCs on my local network' or flick the switch off to stop your PC being used to deliver updates to other computers over the Internet.

Microsoft is doing its best to reduce reliance on the System Control Panel by replacing it with Settings, and from the Creators Update onwards, it's harder to find. If you're a Control Panel fan, you can still jump straight to it by pressing Win-Pause/Break. You can also press Win-R, type sysdm.cpl and then press Enter to go to its Advanced, System Protection and Remote tabs.

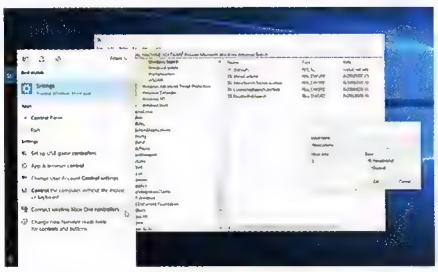

Settings
Home
Active hours
Set active hours to let us know when you typically use this device. We won't automatically restart it during active hours and we won't restart without checking if you're using it.
Start time
8
00
End time (max 18 hours)
20
00
Save
Cancel

You can easily stop Windows Update from attempting to reboot during your normal working hours.

DISABLE CORTANA

Microsoft makes it harder to disable its Cortana search tool with every release – if you didn't click 'No' when setting up the October 2018 Update, you can disable Cortana and convert the search box into a regular search tool.

Press Win-R, type regedit and press Enter to open the Registry Editor.



Remove Cortana and turn the search box into a tool for exclusively searching your computer.

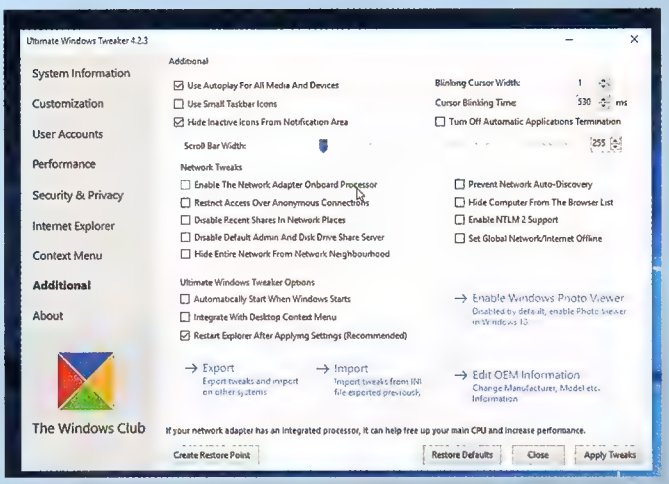
Simplify Windows tweaks

Many useful settings are hidden away in the Registry, but if you download and run the free Ultimate Windows Tweaker 4 tool from **www.thewindowsclub.com/ultimate-windows-tweaker-4-windows-10** – a mere 495KB – you'll find over 200 tweaks to wrest back control of Windows.

Highlights include shortcuts to several Windows tools on the main screen, while the Customisation section contains no less than four tabs packed with settings, such as restoring the classic battery and volume control pop-ups in the Taskbar notification area. Look under the 'This PC' tab to restore classic system tools hidden away in Windows 10.

Another favourite of ours: switch to the Additional section and then click Enable Windows Photo Viewer to bring back the classic Windows 7 photo-viewing tool. You then navigate to Settings > Apps > 'Default apps' where you can restore it as your default photo viewer by clicking 'Choose a default' and selecting it from the list.

You can find out more about individual tweaks in the Ultimate Windows Tweaker 4 tool by rolling your mouse over them, and click Restore Defaults to undo all your tweaks if necessary.



Ultimate Windows Tweaker 4 enables you to tweak many hidden settings in Windows 10 without having to get your hands dirty.

Browse to HKEY_LOCAL_MACHINE\SOFTWARE\Policies\Microsoft\Windows\WindowsSearch. With 'WindowsSearch' highlighted, look for a value marked 'AllowCortana' in the right-hand pane. If it's not present, choose Edit > New > DWORD (32-bit) Value to create it. Once created, double-click the AllowCortana value and change its value to 1. Click 'OK'.

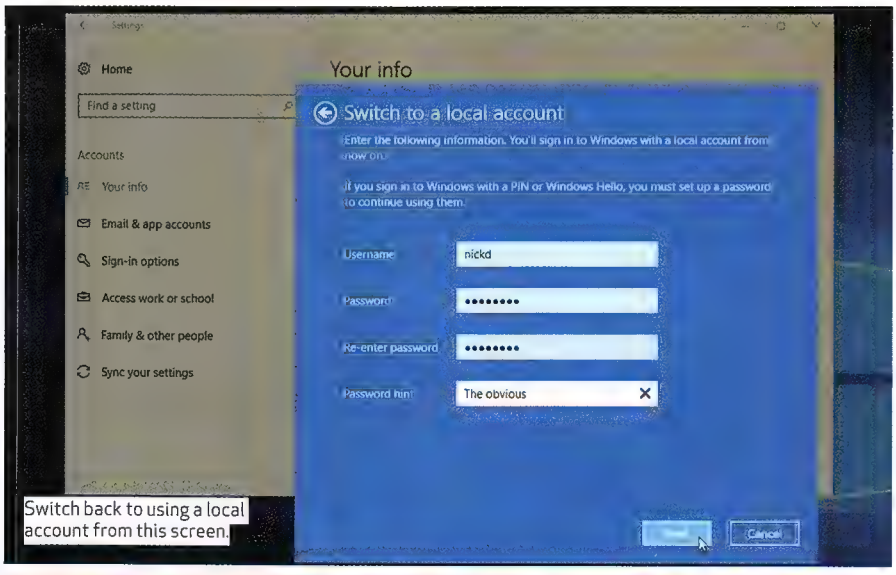
Finally, either reboot or right-click the Taskbar and choose Task Manager. Choose 'More Details' to bring up the Processes tab, scroll down, select File Explorer and click Restart. The search box should now simply say 'Search Windows' – use it to search for files, folders, programs and settings.

MORE TWEAKS

If you have resisted logging in with a Microsoft account when you upgraded to Windows 10, you may now want to switch for convenience's sake. To do this, go to Settings > Accounts > 'Your info'. You'll see an option to sign in with your Microsoft account instead – select it and follow the prompts.

If you want to go back, you can do that to from the same dialog box – this time, choose 'Sign in with a local account instead'. Enter your Microsoft account password, then choose a local username, password and password hint. Click 'Next' to sign out and back in – you'll need to sign into the Microsoft Store to access apps you've previously installed from there as well as other cloud services if you use them, but the underlying account will be a local one.

One new feature in Windows 10 is that you can now scroll inactive windows without selecting them – move the mouse over the window and scrolling affects that window, not your currently selected one. If the behaviour



"One new feature in Windows 10 is that you can now scroll inactive windows without selecting them."

doesn't suit, go to Settings > Devices > Mouse and toggle the 'Scroll inactive windows when I hover over them' switch to Off.

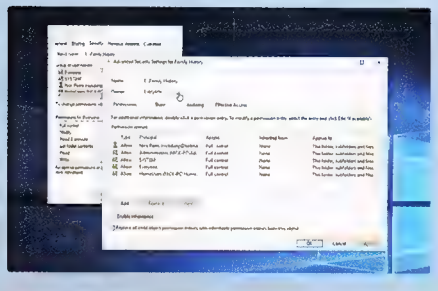
If you upgraded to Windows 10 from a previous version of Windows, you may wonder what product key you'll need should you ever reinstall it on your PC. The answer is: none. If you're ever prompted to enter a product key during setup, just click Skip and Windows will activate itself with no problem.

Finally, some programs continue to use the old Windows XP Help system, which was retired a while back. It used to be offered as an optional download, but no more. Don't let that stop you: go to **www.komeil.com/download/1230** to download winhlp32-windows-7-x86-x64-komeil.cab to your PC. Save it to your hard drive, then double-click the CAB file and drag the three files into a new folder to extract them. Right-click the extracted Install.cmd file and choose Edit. Add the following two lines to the ':: Settings' section:

```
set WindowsVersion=7
goto :BypassVersionError
```

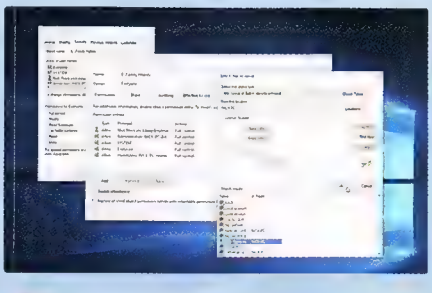
Save the file and exit Notepad. Now right-click Install.cmd again, but this time choose 'Run as administrator'. Click 'Yes' when prompted. A command window should appear, indicating files copied and Registry entries updated.

Reclaim ownership of a folder



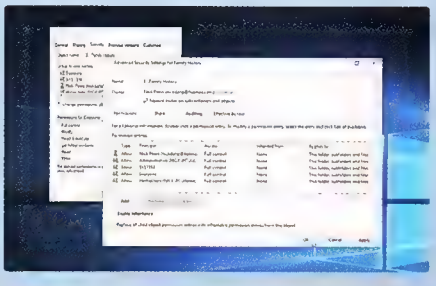
1 ACCESS OWNER

Open File Explorer and browse to the folder in question. Right-click it and choose Properties, then switch to the Security tab. Click 'Advanced' and then click Change next to the current owner's name. You'll need administrator level privileges to be able to do this.



2 LOCATE USER

Type part of your username into the 'Enter object name to select' box and click Check Names – if nothing is found, click 'Advanced...' and simply click 'Find Now' to view all of the available users. Finally, scroll down to select your name, then click OK twice.



3 FINAL TWEAKS

As things stand, you will only be made the owner of the folder itself, not its contents. To rectify this, tick the 'Replace owner on subcontainers and objects' box before clicking OK. Wait while the owner is updated on all the selected files and folders. It shouldn't take long.

Fix hardware problems

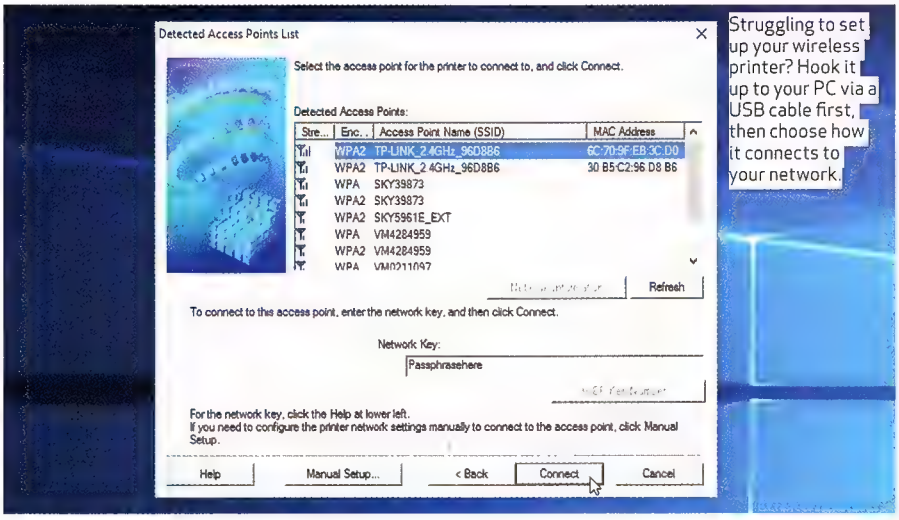
Discover some easy fixes for troublesome computer components with our guide to solving your Windows hardware woes.

One of the annoying things about upgrading Windows is when you suddenly discover that your older hardware is no longer supported. You plug it in, and either nothing happens, Windows tells you drivers aren't available or – in the case of AMD graphics – it installs a basic display adapter that's stuck at a low resolution.

Before you throw out the baby with the bathwater, press Win-Pause/Break to open the System Control Panel and confirm your operating system type (32-bit or 64-bit). Now visit your hardware manufacturer's website and seek out the latest version of its driver, making sure it matches your system type – Windows 8, 7 and even Vista drivers should work.

If you own two or more printers, it can be a hassle switching between them. One workaround is to switch default printer to whichever one you printed to last – click Start > Settings > Devices > 'Printers & scanners' and flick the 'Let Windows manage my default printer' switch to On.

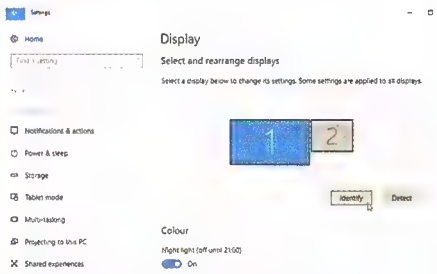
Struggling to get your network printer working? If your wireless printer doesn't have a WPS switch for easy connection to the network, connect it to your PC with a USB cable after downloading and running the latest printer software – be sure to select Wireless during setup to enable the installer to help you connect the printer to your wireless network.


Detected Access Points List
Select the access point for the printer to connect to, and click Connect.
Detected Access Points:
Stre... Enc... Access Point Name (SSID) MAC Address
WPA2 TP-LINK_2.4GHz_96D8B6 6C:70:9F:EB:3C:D0
WPA2 TP-LINK_2.4GHz_96D8B6 30:B5:C2:96:D8:B6
WPA SKY39873
WPA2 SKY39873
WPA2 SKY5961E_EXT
WPA VM4284959
WPA2 VM4284959
Refresh
To connect to this access point, enter the network key, and then click Connect.
Network Key:
Passphrasehere
For the network key, click the Help at lower left.
If you need to configure the printer network settings manually to connect to the access point, click Manual Setup.
Help
Manual Setup...
< Back
Connect
Cancel

Struggling to set up your wireless printer? Hook it up to your PC via a USB cable first, then choose how it connects to your network.

COMMON LAPTOP ISSUES

Problems with your laptop screen? If the screen flickers or the resolution is too cramped, open Device Manager (press Win-R, type devmgmt.msc and press Enter). If a yellow exclamation mark is present next to either the Display Adapter or Monitor then double-click the entry to find out what the problem is; look for an updated driver from your laptop manufacturer or take a closer look at any error codes or troubleshooting options offered.



Plug your laptop back into your main monitor if you can't get the display working to troubleshoot.

Hard drive health

Make sure your hard drives are in tip-top condition. You can check their physical health using tools such as Speccy (**www.piriform.com/speccy**), which uses a drive's S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) status to alert you to early signs of potential disk problems. Also periodically run the Disk Check tool outside of Windows to pick up errors the Windows-based tool seems to miss.

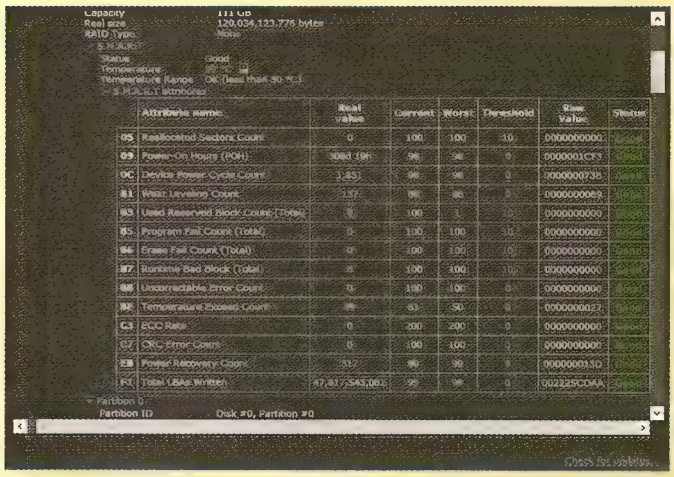
To do that, right-click the Start button and choose 'Command Prompt (admin)', then type the following line:

```
chkdisk c: /f /r
```

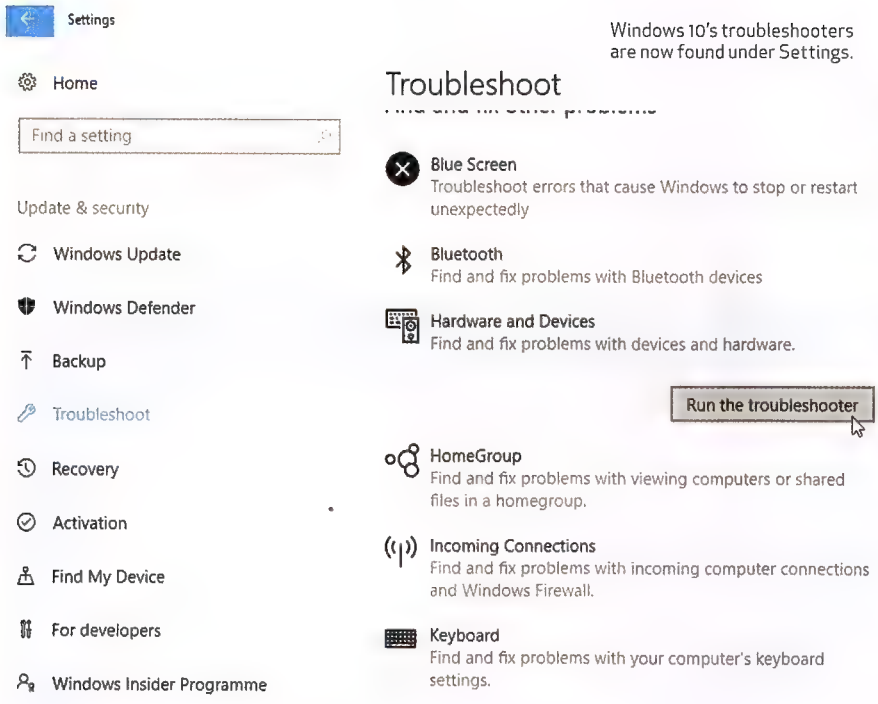
Press Y when prompted, then reboot your PC to run the disk check, which will attempt to fix any errors it finds. If the disk check keeps appearing on startup, click Start > Settings > 'Update & security' > Recovery and click 'Restart now' under 'Advanced start-up'. At the Recovery menu, choose Troubleshoot > Advanced Options > Command Prompt. Your PC will reboot and you'll need to select your username and enter your password. When the prompt appears, type the following, substituting c: for whatever drive letter you're scanning:

```
chkdsk c: /f /r /x
```

This should fix the problem.



Speccy enables you to view each hard drive's S.M.A.R.T. attributes in detail, highlighting any potential issues that may shorten its life.



Windows 10's troubleshooters are now found under Settings.

If the screen appears to be dead and you recently plugged it into a monitor, it may still be set to output to the HDMI port – check for special keys that enable you to cycle through available displays – typically something like Fn-F3 – to see if the screen comes back, or re-connect it to a monitor and go to Start > Settings > System > Display. Look under 'Multiple displays' to set the default screen back to the laptop.

If the problem persists, then it may be a physical problem. You could source a service manual online and open your laptop to check for a loose connection, or if all else fails try an online repair service, of which there are many – google 'laptop repair'. We're not in a position to recommend one over another, though.

Other common driver issues may be linked to your laptop's trackpad not working as it should – it's worth looking on your manufacturer's website for a dedicated driver. If one exists, go to Start > Settings > Devices > 'Mouse & touchpad' and click 'Additional mouse options'. Look for a Device Settings tab where you may find some configurable tweaks to make it more useful.

Finally, head to Windows 10's battery saving feature via Start > Settings > System > Battery, where you can tweak your laptop's battery saver settings to come on earlier and so prolong the time it lasts between recharges. Also look at switching your web browser to Opera (**www.opera.com**), which comes with its own built-in battery saver to extend browsing time, too.

MORE TIPS

Sleep-related computer problems can usually be fixed once you know which component is refusing to play nicely. Right-click the Start button and choose 'Command Prompt (admin)'. Type powercfg –energy and press Enter. When complete, browse to C:\Windows\System32 and double-click the energy-report.html file to review in your browser. Make a note of errors and then identify suspect devices in Device Manager. Double-click each in turn and look under the Power Management tab (if it exists) for settings to prevent that device from bringing your computer prematurely out of standby.

Most sound-related problems come down to the incorrect playback (speakers) or recording (microphone) devices being selected. Click the '^' button in the Taskbar notification area and look for a white speaker icon. Right-click this and choose either Playback or Recording devices to see a list of available devices, including which one is currently the default. Select the correct device and click Set Default – you can click the down arrow next to it to choose different default devices for regular sound and communication through applications such as Skype.

Finally, go to Start > Settings > 'Update & security' > Troubleshoot where you will now be able to access all the available Windows troubleshooters. Start with the 'Hardware and Devices' option to see whether this can help resolve the issue for you.

DVD drive issues

Slimline external DVD writers don't cost the Earth, so consider buying one as a replacement while you test out your main drive.

Problems with your CD or DVD drive? There's no longer a dedicated troubleshooter for this problem, so you'll need to search for a solution at **http://support.microsoft.com/kb/314060** – here you'll find a handy step-by-step guide that covers most of the steps you'll need to follow to resolve the issue, such as making sure the drive is visible in Windows, and that third-party burning software – particularly if it was installed prior to you upgrading to Windows 10 isn't responsible for the problem.

If you're struggling to burn DVDs or CDs, eliminate all software problems before assuming the drive itself is faulty (remember, some drives use different lasers for CD and DVD, so the drive may appear to work when in fact it needs replacing if you're able to burn or read one type of disc, but not the other). If all else fails, buy a low-cost external model – around $50 – and plug it into your PC. If that works okay, then the original drive may have failed and can be replaced by your new one.

Internet and security

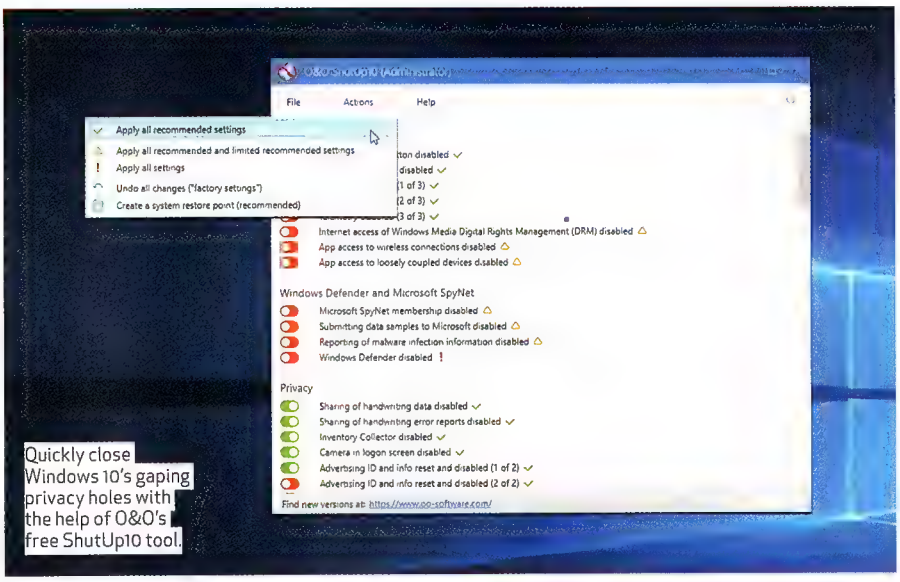
Reduce spam, improve your privacy and fix all kinds of network and Internet-related problems with these useful tips.

Let's start by tightening Windows 10's privacy controls. Even if you diligently went through the setup wizard when you installed the current October 2018 Update, it can be confusing knowing which settings to pick – and even then, you'll find that there are other privacy tweaks you should consider applying.

Windows 10 thoughtfully scatters these settings far and wide throughout your PC, but by downloading the latest version of the free O&O Shutup10 tool from **www.oo-software.com/en/shutup10** you can view and manage them easily. Once downloaded, double-click OOSU10.exe and give it administrator access when required.

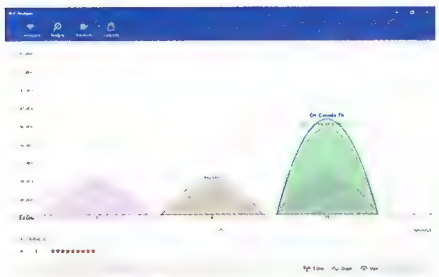
If you've previously run the tool, it'll detect previous settings; otherwise, you'll see a list of switches you can click on for an explanation. Either toggle switches manually, or go with O&O Shutup10's recommendations via the Actions menu. All changes can be undone, and a System Restore point is taken, just in case.

Shutup10 can be used to stop Windows 10 from displaying app 'suggestions' (otherwise known as ads) appearing in the Start menu via its Miscellaneous section. Windows will also nag you to set up or install OneDrive if you don't already use it in File Explorer – to switch this 'nagging' off open File Explorer and click Options under the ribbon's View tab. Switch to the View tab of Folder Options and untick 'Show sync provider notifications' under 'Advanced settings'.


File
Actions
Help
Apply all recommended settings
Apply all recommended and limited recommended settings
Apply all settings
Undo all changes ("factory settings")
Create a system restore point (recommended)
Internet access of Windows Media Digital Rights Management (DRM) disabled
App access to wireless connections disabled
App access to loosely coupled devices disabled
Windows Defender and Microsoft SpyNet
Microsoft SpyNet membership disabled
Submitting data samples to Microsoft disabled
Reporting of malware infection information disabled
Windows Defender disabled
Privacy
Sharing of handwriting data disabled
Sharing of handwriting error reports disabled
Inventory Collector disabled
Camera in logon screen disabled
Advertising ID and info reset and disabled (1 of 2)
Advertising ID and info reset and disabled (2 of 2)
Find new versions at: https://www.oo-software.com/
Quickly close Windows 10's gaping privacy holes with the help of O&O's free ShutUp10 tool.

FIX CONNECTION PROBLEMS

Are you struggling with your Internet connection? If you've tried the Network Connection Troubleshooter (access it from the network icon in the

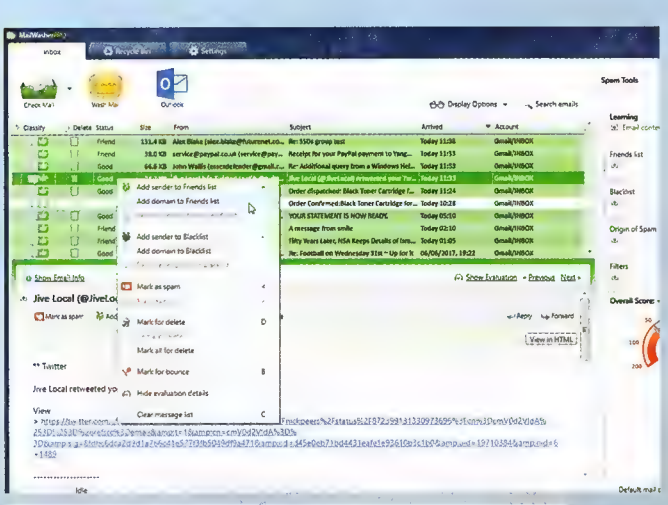

Poor Wi-Fi performance can be caused by congestion from surrounding networks.

Block spam

There's no foolproof way to completely stop yourself from receiving spam – if your email address falls into the hands of a spammer, all you can do is find effective ways of filtering it out. Consider installing a third-party tool such as Mailwasher (**www.mailwasher.net**) that you can use to screen your emails. Once installed, take the time to 'train' the app so it recognises the kind of spam emails you receive and then configure it so it deletes them automatically before they reach your inbox.

You can also minimise spam by switching to plain text view by default and never opening a spam message – it'll almost certainly contain some form of tracking device to alert the spammer to the fact your address is active and in use. If you do open a message, don't click any links – instead, simply mark the message as spam so your email provider knows what to do with it in future.

Finally, take the time to check your junk mail settings to fish out legitimate emails – if you recognise a marketing email as genuine, take the time to unsubscribe rather than marking it as spam.

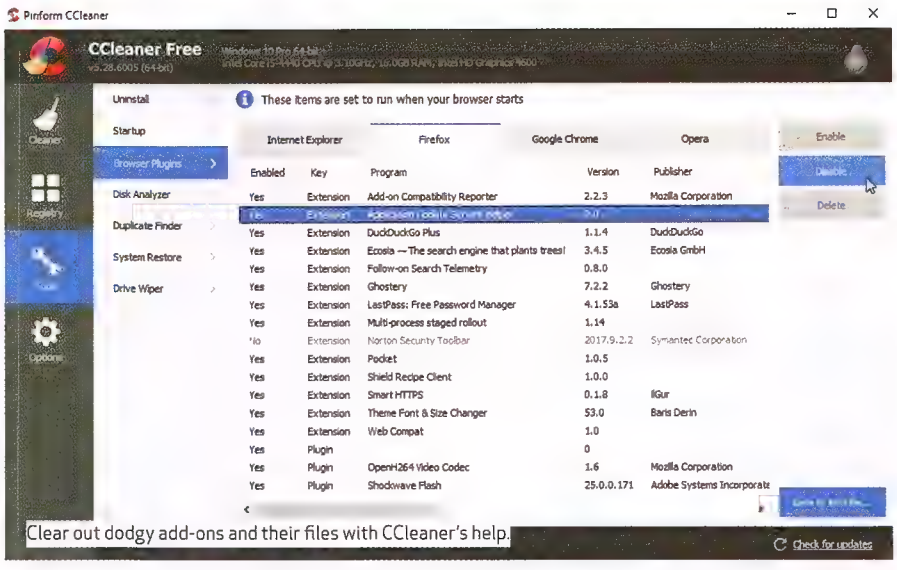

Use Mailwasher to build up a list of trusted contacts as well as known spammers – it'll help filter unwanted mail out of your mailbox.

Taskbar notification area) with no success, take a System Restore point. Now download and run the Complete Internet Repair tool from **www.rizonesoft.com/downloads/complete-internet-repair/** – click the 'i' next to each repair to find out more about it. We recommend trying repairs one at a time, but verify the problem is with your PC and not your wider network before running it.

If your Internet connection works, but is periodically sluggish, check that your cloud storage provider isn't hogging all the available bandwidth and, if it is, restrict its upload speeds. OneDrive users should right-click the OneDrive Taskbar notification area icon and choose Settings > Network. Make sure 'Adjust automatically' is selected; other cloud providers should offer a similar setting (you can choose 80 percent if no automatic setting is provided).

Problems with your Wi-Fi connection could be down to interference from another network – search for WiFi Analyzer in the Microsoft Store and use that to locate a channel (typically 1 or 11) where congestion is lowest. Change the channel setting itself through your router's configuration utility in your web browser – see your router's instruction manual for how to do this.

Having problem connecting to your Homegroup? That feature's been deprecated now by Microsoft so consider dropping it entirely and use regular file sharing instead; otherwise, if the Homegroup troubleshooter fails to yield a solution, start from scratch. First, leave the current homegroup on all your PCs. Then switch them all off except for one. Create a new homegroup on this PC, then connect the others to the new homegroup one at a time.


Piriform CCleaner
CCleaner Free
Uninstall
Startup
Browser Plugins
Disk Analyzer
Duplicate Finder
System Restore
Drive Wiper
These items are set to run when your browser starts
Internet Explorer
Firefox
Google Chrome
Opera
Enable
Disable
Delete
Enabled Key Program Version Publisher
Yes Extension Add-on Compatibility Reporter 2.2.3 Mozilla Corporation
Yes Extension DuckDuckGo Plus 1.1.4 DuckDuckGo
Yes Extension Ecosia — The search engine that plants trees! 3.4.5 Ecosia GmbH
Yes Extension Follow-on Search Telemetry 0.8.0
Yes Extension Ghostery 7.2.2 Ghostery
Yes Extension LastPass: Free Password Manager 4.1.53a LastPass
Yes Extension Multi-process staged rollout 1.14
No Extension Norton Security Toolbar 2017.9.2.2 Symantec Corporation
Yes Extension Pocket 1.0.5
Yes Extension Shield Recipe Client 1.0.0
Yes Extension Smart HTTPS 0.1.8 lIGur
Yes Extension Theme Font & Size Changer 53.0 Boris Derin
Yes Extension Web Compat 1.0
Yes Plugin 0
Yes Plugin OpenH264 Video Codec 1.6 Mozilla Corporation
Yes Plugin Shockwave Flash 25.0.0.171 Adobe Systems Incorporated
Check for updates
Clear out dodgy add-ons and their files with CCleaner's help.

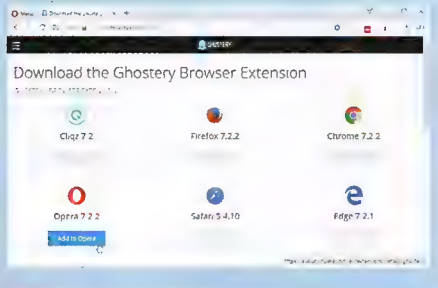
TIGHTEN SECURITY

If you're in the process of switching to a new security product, make sure all traces of the old tool are removed first. Most security providers offer a manual removal tool that should purge all traces of it from your system – visit **http://support.eset.com/kb146/** for a list if you're struggling to track one down. Try running the tool even if you've already removed the program and it's interfering with your new software.

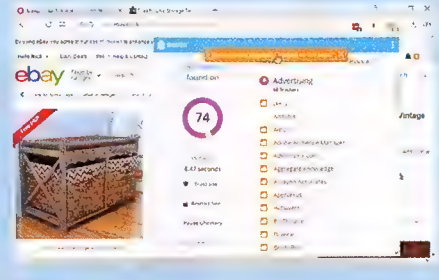
If you have not yet done so, switch on two-step verification to offer additional protection for accounts that use them (at the very least protect core services such as LastPass or your webmail provider). Not all programs support two-step verification, but any online service worth its salt will enable you to generate one-time app passwords that you use to connect the program to your service without compromising security. Look in its Security settings for the app password generator.

Malwarebytes Anti-Malware (**www.malwarebytes.com**) is an essential tool for any user – it can remove infections, like potentially unwanted software that other tools miss. But if those infections keep coming back, you need to identify the source. Check where the files originate – if they're inside your web browser's cache, you should check to see what add-ons are installed as one of these could be responsible. Use a tool like CCleaner (**www.piriform.com**) to clear your browser cache and disable or even remove suspicious add-ons. Or consider buying the Professional version of Malwarebytes to provide real-time protection against these and other threats (such as malicious websites).

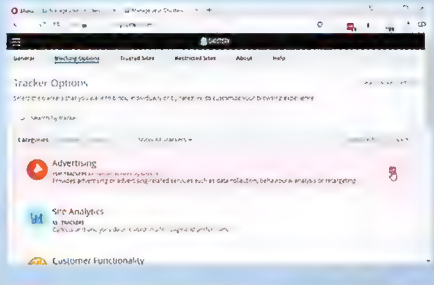
Manage web cookies with Ghostery



1 GET GHOSTERY
Browse to **www.ghostery.com** and click the Install button, then follow the prompts to install Ghostery via your browser's add-on repository. Choose whether to share anonymised data, then create a user account to access Ghostery across multiple browsers or computers.



2 BASIC FUNCTIONALITY
Keep an eye on Ghostery's icon in your browser's toolbar when you visit websites. It'll list the number of tracking cookies – click for a summary. Be sure to pay attention to specific warnings – click 'Restrict site' to apply site-wide restrictions or review and manage individual cookies.



3 BLOCK TRACKERS
Right-click the Ghostery icon and choose Settings to manage your account through your browser. You can review current settings, plus go to Blocking Options to automatically block known trackers based on their type to quickly benefit from Ghostery's tools.

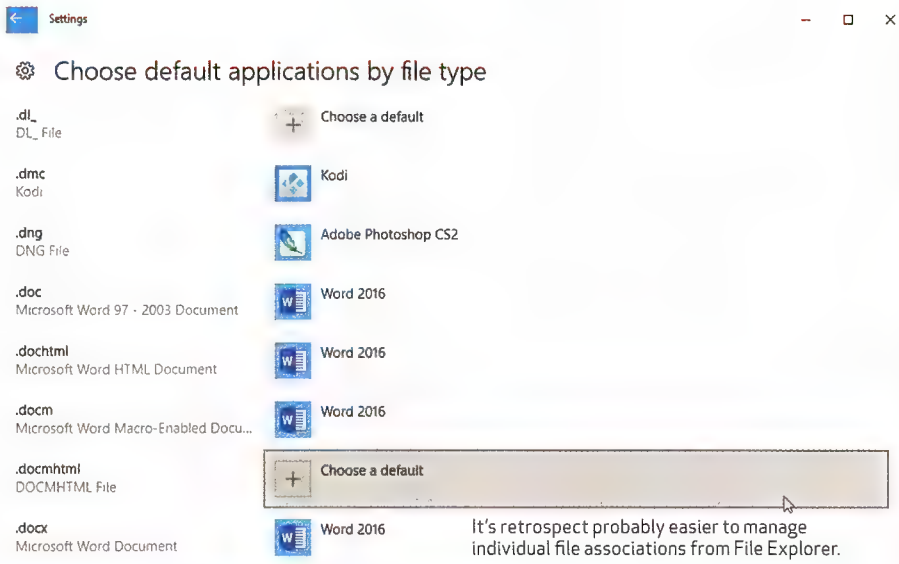
Fix software problems

We've tamed Windows 10, your hardware and the Internet – now it's time to tackle your applications with these handy tips.

When a program controls a file association, it will always open when you double-click that file type. Windows 10 makes it harder for third-party programs to seize control of file associations, but it's still possible, and every time a new Windows update is released, you can easily be tricked into handing back associations to Microsoft's choice of app, not yours.

Start fixing problems by clicking Start › Settings › Apps › 'Default apps'. From here you can quickly switch or set defaults for email, maps, music, photos, video and web browser – just click the appropriate button and choose your desired app. Other universal changes can be made, too – start by clicking 'Set defaults by app' to access a list of all your programs. Click one to find out what defaults it has and to either allocate it all the defaults it wants or to select which ones it can have.

You can also choose individual applications for specific file types – either by clicking 'Choose default applications by file type' from this Settings dialog, or by right-clicking one of the files in question in File Explorer and choosing 'Open with › Choose program'.



It's retrospect probably easier to manage individual file associations from File Explorer.

MANAGE APPS BETTER

Have you noticed how there are no entries for some of Microsoft's default apps under 'Apps & features'? You can remove these apps via the PowerShell command prompt, but it's fiddly. IObit Uninstaller (**www.iobit.com/en/advanceduninstaller.php**) enables you to remove default Microsoft apps as well as other Microsoft Store-installed apps: skip prompts to add a tab before downloading the program, and untick 'Install Advanced SystemCare...' before clicking Run Now to install it.

Once IObit Uninstaller has launched, navigate to Windows Apps and extend the Windows Apps section to remove the apps you don't want – you can always reinstall them through the Microsoft Store later. While you're here, use IOBit Uninstaller to more thoroughly uninstall programs as well as apps from your PC, and click its toolbox icon to access a Forced Uninstall button that can help you get rid of programs that have 'lost' their uninstaller.

Play DVD and Blu-Ray movies in Windows

Want to play DVD-Videos in Windows 10? Both Kodi (**www.kodi.tv) and VLC Media Player (www.videolan.org/vlc**) offer free support (including menu access) – VLC should work with non-region 2 discs, too. Simply pop the disc in and it should play like normal.

Blu-ray discs are trickier – the following free add-ons should enable you to play most older AACS-encrypted discs along with a handful of BD+ discs. Point your browser at **https://vlc-bluray.whoknowsmy.name/**, then download the Keys database and place it in C:\ProgramData\aacs. Next download the relevant AACS dynamic library for your PC (either 32-bit or 64-bit), then place the downloaded DLL file inside your VLC program folder. on your PC.

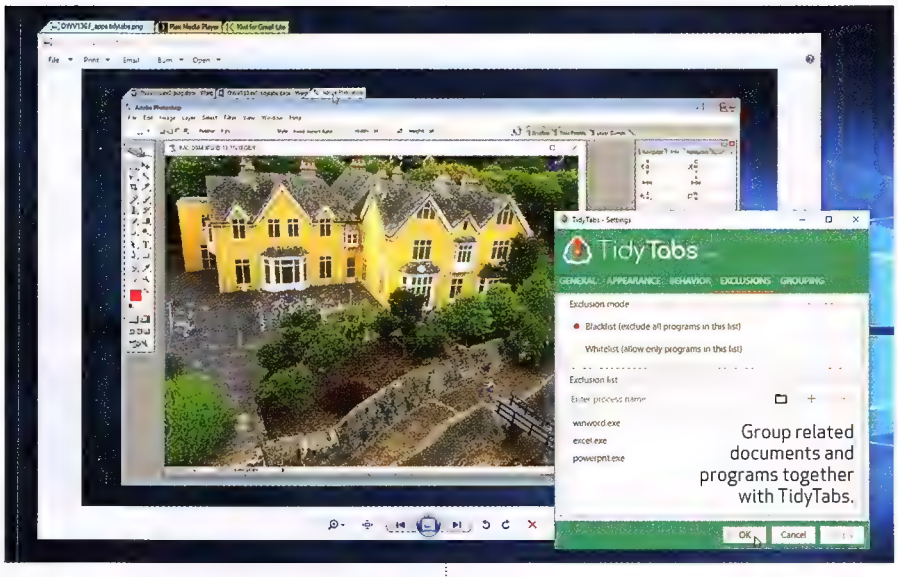
Launch VLC (a portable version is also available from **https://portableapps.com/apps/music_video/vlc_portable**) and pop your Blu-ray into a compatible drive. In the VLC app, choose Media > Open Disc. Select Blu-ray, choose your starting title (there's no menu support) and click Play. After a delay – and if you're lucky – you'll be able to watch your Blu-ray!

Armed with the right downloads you can play a decent number of Blu-ray movies for free with VLC Media Player.

Speaking of the Microsoft Store, if you run into problems getting it to work, try a pair of Microsoft fix-it tools – browse to **http://aka.ms/diag_apps10** and **http://aka.ms/diag_cssemerg7008** respectively to download and run them.

If you navigate to Start › Settings › Apps › 'Apps & features' you'll see it's possible to move apps installed through the Microsoft Store to another drive or partition – handy if your main drive is an SSD and is running low on space. You can move regular desktop apps, too – for this you'll need a program called Steam Mover, which you can download from **www.traynier.com**.

If this sounds like too big a step – or you want to cut back on the number of installed apps altogether – then look at PortableApps (**www.portableapps.com**). This handy platform enables you to build, run and manage a collection of programs from a single folder, which you can store anywhere, even on a USB flash drive. No Registry entries mean these apps travel with you. Visit your favourite program websites and look for portable builds in the download section. Then download the ZIP file, extract the contents to a folder inside the PortableApps folder and open the PortableApps platform – your new app should be added to the list under Other (right-click the shortcut to move it to a different category).



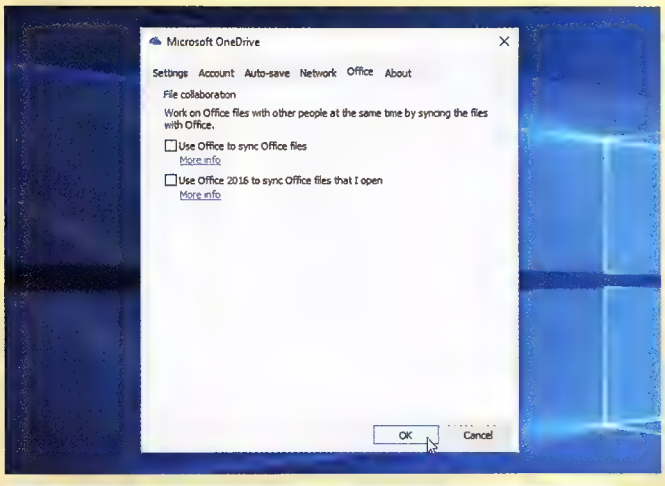
TIDY YOUR DESKTOP

If you frequently have loads of program or document windows open, save time moving between them by organising them into tabs instead, just like your web browser. TidyTabs (**www.nurgo-software.com/products/tidytabs**) enables you to group related windows from different programs together – upgrade for US$9 to group more than three windows together at once as well as other enhancements. TidyTabs works with Office, but it can be glitchy – instead, try Office Tab (US$29 after free trial, **www.extendoffice.com/product/office-tab.html**), which offers similar functionality, but only works with Word, PowerPoint and Excel.

Finally, struggling to get older apps to run in Windows 10? If you can't source a newer version or an update (use **http://alternativeto.net/**), try right-clicking the program shortcut or installer file and choosing 'Troubleshoot compatibility' to see if Windows can apply compatibility settings. If all else fails, and you have an older copy of Windows lying around, you can create a virtual machine using VirtualBox (**www.virtualbox.org**). Choose 32-bit for maximum compatibility, and run your old app inside that instead. It works surprisingly well.

IObit Uninstaller 6.4
Uninstall
Windows Apps (37)
Streamline Windows 10 by removing the built-in apps you don't use with IObit Uninstaller.

Take back control of Office


Microsoft OneDrive
Settings Account Auto-save Network Office About
File collaboration
Work on Office files with other people at the same time by syncing the files with Office.
Use Office to sync Office files
More info
Use Office 2016 to sync Office files that I open
More info
OK
Cancel

Microsoft's OneDrive tries to force Office 365 to save directly to the cloud, which slows things down. Make it default to your hard drive instead.

Microsoft is incredibly keen for you to use Office 365, which is why Windows 10 will regularly prompt you to download and install it. But if you get fed up with its nagging, click Start and locate the 'Get Office' shortcut. Right-click this and choose Uninstall to remove it.

If you're an Office 365 user you may be frustrated by the way it works with OneDrive, saving directly to the cloud rather than to your local OneDrive folder. To stop this behaviour, you need to open each Office app in turn, then choose Options from the File tab on the Ribbon. Select 'Save' and tick 'Save to Computer by default'. You're not done yet – next, click '^' in the Taskbar notification area, right-click the OneDrive cloud icon and then choose Settings. Now switch to the Office tab and untick both sync boxes before clicking OK.

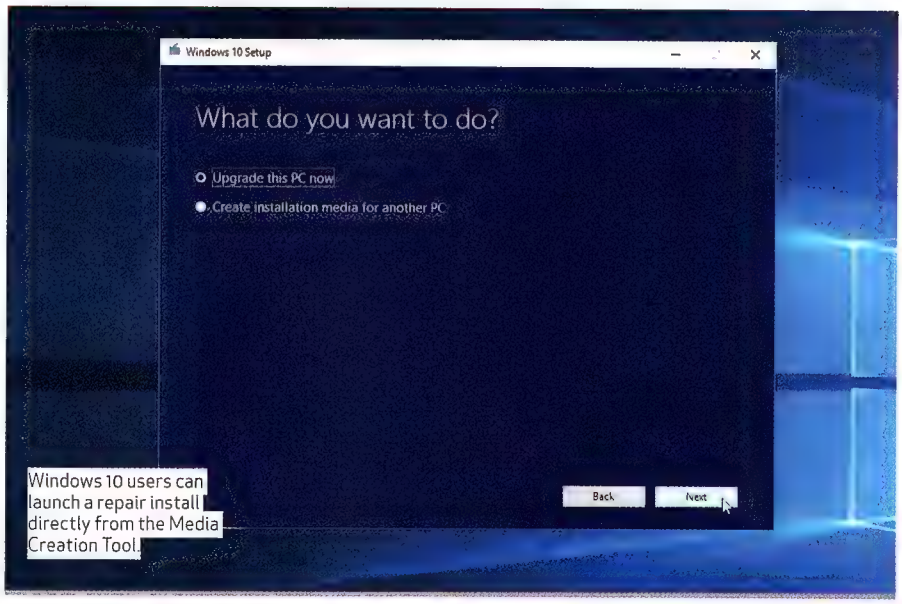
Here's another tip to save you time switching between controls on the Ribbon in Office. Right-click a favourite tool and choose 'Add to Quick Access Toolbar'. If you run out of space, click the 'v' arrow next to your existing shortcuts and choose 'Show Below the Ribbon' to locate it there instead. ■

Repair a Windows install

If you're trying to fix a problem, a refresh or repair install may be the best route to go down. Here's what you need to do.

Not all reinstalls require a complete wipe of your hard drive. A repair or refresh installation leaves your programs, settings and files in place, and restricts itself to installing a fresh copy of your Windows files over the top of your existing copy. If your problem is linked to a corrupt file or Windows setting, the repair installation can usually fix it.

All repair installs share one common characteristic: you must launch them from Windows itself. You can't boot from your install media and repair Windows through that; you need to boot into Windows, then start the repair process from there. If you're unable to boot into Windows, therefore, you'll need to skip ahead and perform a full destructive recovery instead.



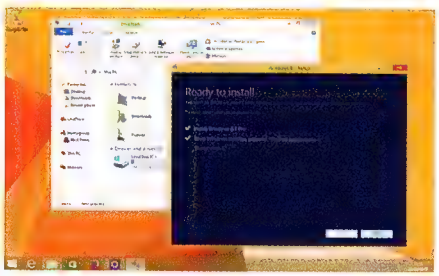
Windows 10 users can launch a repair install directly from the Media Creation Tool.

START THE REPAIR

Starting a repair install varies depending on your PC model and what version of Windows you're running. Windows 8.1 and 10 users should (at least initially) avoid the Refresh/Reset options provided under Settings > 'Update & recovery'. These options will preserve your files and any apps you've installed through the Microsoft Store, but any desktop programs you've installed will be wiped along with Windows itself.

Instead, you should 'upgrade' your copy of Windows, which performs a similar non-destructive reinstall to Refresh/Reset with the added bonus that your apps – including those you've installed outside of the Microsoft Store – will be preserved. To do so, you'll need your Windows installation media – see the step-by-step guide on the facing page if you don't have the latest version.

Why do you need the latest install

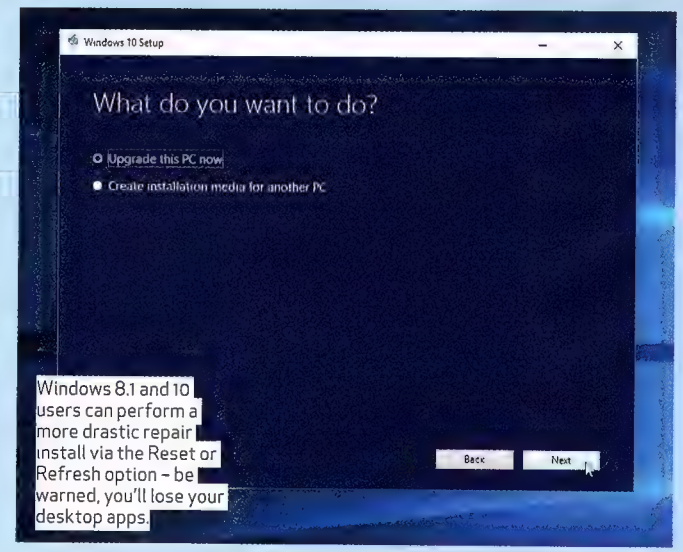

Both Windows 8.1 and 10 offer a similar way to repair your Windows installation.

Post-repair steps

Start by stress-testing your desktop to verify that everything works as it should – sometimes the repair can introduce more problems than it solves, in which case if you're running Windows 8.1 or 10 you can undo the changes. Go to Start > Settings > 'Update & recovery' > Recovery and look for an option to go back to your previous version – click 'Get started' and then follow the prompts.

If the repair doesn't appear to fix your underlying problem, Windows 8.1 and 10 users can take one more intermediate step – the reset or repair. It will see you waving goodbye to all those desktop programs you've installed (including MS Office and your third-party security software), but it will preserve your Microsoft Store apps, files and Windows settings. Leave your install media inserted, then head over to the 'Update & recovery' > Recovery section under Settings. This time, click the 'Get started' button under the Refresh (Windows 8.1) or Reset (Windows 10) option and follow the prompts.

If this more drastic approach doesn't work, or you're running Windows 7, then continue reading for destructive reinstall options.



Windows 8.1 and 10 users can perform a more drastic repair install via the Reset or Refresh option – be warned, you'll lose your desktop apps.

media? It's because upgrade installs only work if the version of Windows on your PC matches that on your install media, so if you've installed Service Pack 1 in Windows 7, for example, you need up-to-date installation media to avoid the laborious task of first attempting to uninstall Service Pack 1 through Windows Update (assuming that you're able to), then reinstalling Windows and then downloading and reinstalling Service Pack 1, along with all of your other updates.

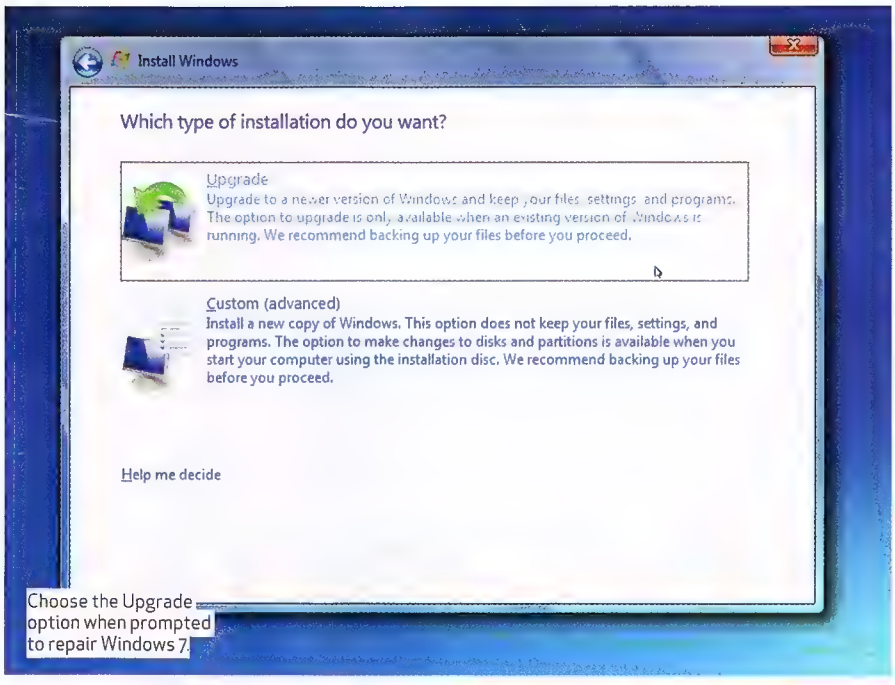
Windows 10 users can also launch the repair process directly from the Media Creation Tool by choosing Upgrade when prompted, but given the amount of time it takes to download the files, you might as well create your install media instead – just in case the upgrade install doesn't work and you decide to go down the path of a full-blown destructive install.

LAUNCH THE REPAIR PROCESS

The procedure from this point onwards varies according to which version of Windows that you have. If prompted to download updates, do so to save time post-install.

Windows 8.1 and 10 users will be asked what they want to keep. Windows 8.1 users should find settings, personal files and applications are selected by default (click 'Change settings' if this isn't the case), while it's 'Keep personal files and apps' in the case of Windows 10 (don't worry, in this circumstance, 'apps' also applies to any desktop programs that you have installed).

Windows 7 users need to pop in their install media, double-click setup.exe and follow the regular reinstall process. When prompted, click 'Go online to get the latest updates for installation (recommended)' to download post-SP1 security fixes now, then accept the licence agreement and choose Upgrade when prompted.

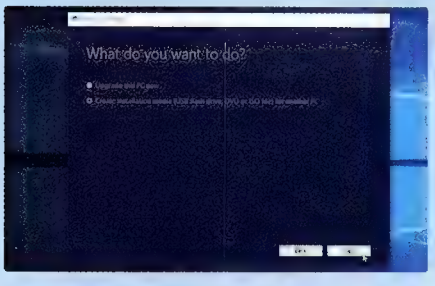

Install Windows
Which type of installation do you want?
Upgrade
Upgrade to a newer version of Windows and keep your files, settings, and programs. The option to upgrade is only available when an existing version of Windows is running. We recommend backing up your files before you proceed.
Custom (advanced)
Install a new copy of Windows. This option does not keep your files, settings, and programs. The option to make changes to disks and partitions is available when you start your computer using the installation disc. We recommend backing up your files before you proceed.
Help me decide
Choose the Upgrade option when prompted to repair Windows 7

"Start by seeing if the specific issue has been solved, then check to see that the rest of Windows still works."

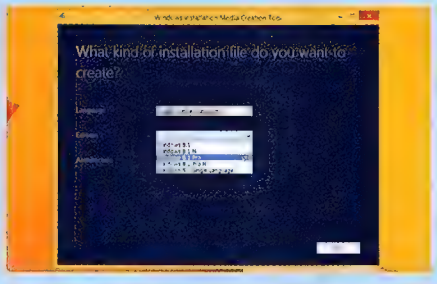
The upgrade process can take up to an hour on whichever version of Windows you're repairing, even on the fastest machine, so be patient. Your PC will reboot several times. If you're reinstalling Windows 7, you'll be prompted to enter your product key again, so have it handy.

Windows 8.1 and 10 will relaunch with the same setup wizard you'd see when upgrading from an earlier version of Windows. It's all very straightforward, but don't skip through the Express settings (if they appear); make sure you review all settings to lock down privacy.

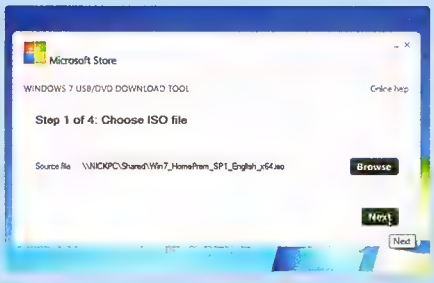
Get the latest install media



1 WINDOWS 10
Head to **www.microsoft.com/software-download/windows10** and click 'Download tool now'. Once downloaded, open MediaCreationTool.exe. When prompted, select 'Create installation media' and follow the prompts to create either a USB flash drive or an ISO file (for burning to DVD).



2 WINDOWS 8.1
Download the Media Creation Tool from **www.microsoft.com/software-download/windows8** – input your language, edition of Windows 8.1 and PC architecture (32-bit or 64-bit) and then click Next. Choose to create either a USB flash drive or an ISO file and then follow the prompts to the end.



3 WINDOWS 7
Go to **www.microsoft.com/software-download/windows7** and enter your product key – choose a 32-bit or 64-bit version as required. Once downloaded, double-click the file to burn to DVD, or use the Windows USB Download Tool (**https://wudt.codeplex.com**) to create a USB flash drive.

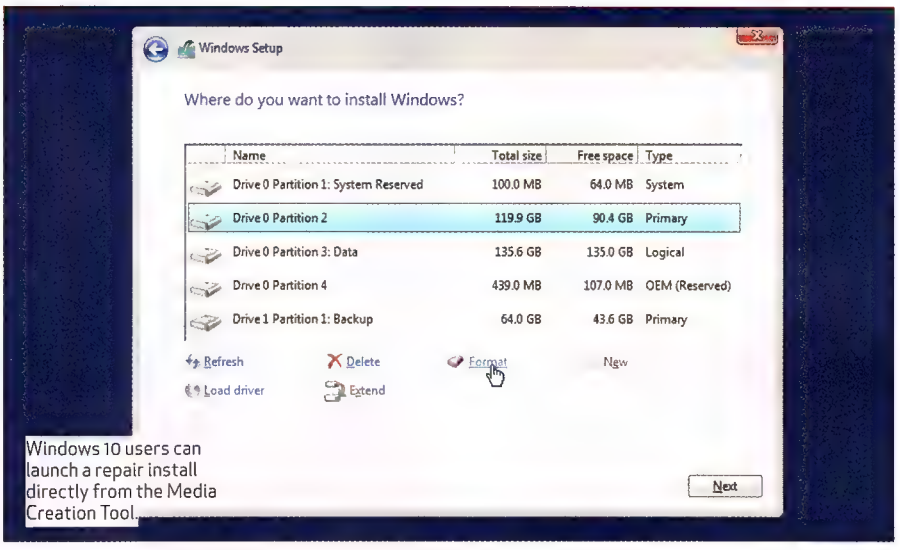
A full, destructive reinstall

If you're looking to wipe the slate clean, or need to recover from major issues, the nuclear option is always the best one.

Reinstalling Windows from scratch – namely, wiping your system drive to install a fresh version of Windows on to it – is the ultimate choice for anyone looking to revive a slow PC or resolve a major, non-hardware issue. Here we'll step you through the entire process – if you're simply looking to repair an existing Windows install, turn to our guide on the previous page.

Before you begin, make sure your PC is fully backed up. A full reinstall really is destructive – nothing left on your C drive will exist once you've finished.

If you'd like to transfer selected program settings from old installation to new, download the portable CloneApp tool (**www.mirinsoft.com**) to your backup drive. Once complete launch the tool by right-clicking CloneApp.exe and choosing 'Run as administrator' and go through its list of 247 supported apps to see if yours are there. If any are, tick the box beside each one you want to save the settings for. If any apps aren't covered – or you want to back up additional settings – then choose Custom where you manually specify the files, folders and Registry keys where your program settings are stored. You should also follow the step-by-step guide on the previous page to ensure you have the latest installation media for your target version of Windows. This will ensure a cleaner, more up-to-date installation from the off.



Windows 10 users can launch a repair install directly from the Media Creation Tool.

It's also worth sourcing networking and graphics drivers now rather than relying on Windows. Consult your PC or motherboard manufacturer's website for these, or visit your Wi-Fi adapter or graphics card manufacturer's site – download them to your backup drive.

Uninstall any products that require activation – this should deactivate the licences and allow you to use them with your new install. Be sure to have product keys and program installers to hand.

START YOUR REINSTALL

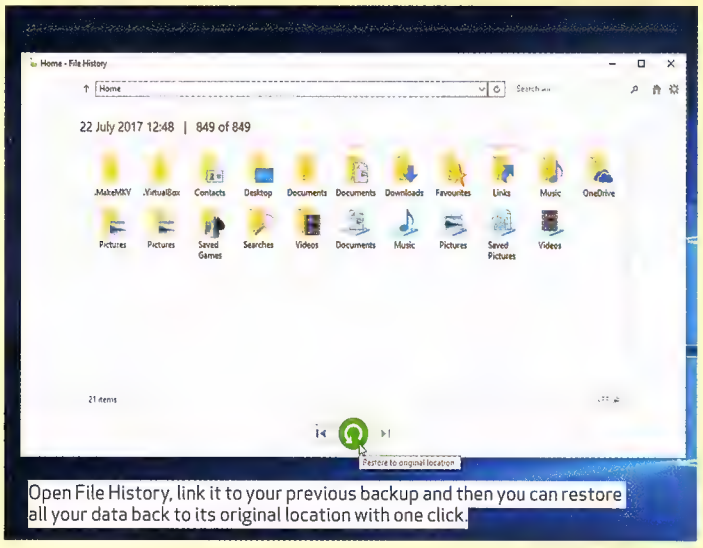
A full destructive reinstall should always be started by booting from your installation media, be it a DVD or USB flash drive. Check the step-by-step guide on the previous page for some pointers. The reinstall process doesn't differ much across Windows 7, 8.1 or

Restore programs, settings and data

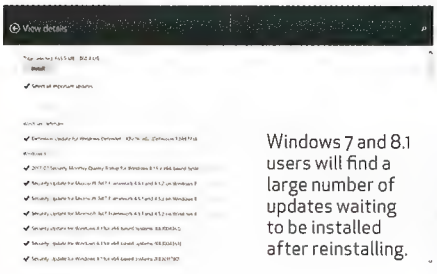
Once Windows is reinstalled, open Windows Update to bring Windows fully up to date – don't be surprised if there are hundreds of updates still to apply in the case of Windows 7 and 8.1. Once it's fully up to date, consider reinstalling Macrium Reflect Free and taking your first drive image – a vanilla backup you can restore in future instead of reinstalling Windows itself.

Next, it's a case of reinstalling your core apps. Once in place, open CloneApp from your data drive. If you click the Restore button, every single program setting you backed up will be restored – if there are any backup settings you don't want to restore, select Options to locate the backup folder, then open it and move any program folders you want to ignore out of the folder temporarily before clicking the Restore button. Now, take your second Macrium Reflect backup – a 'perfect' snapshot, as it were.

Finally, open File History or the Windows Backup and Restore tool and take steps to restore any data you backed up, then make sure the tool is configured to carry on backing up going forward.



Open File History, link it to your previous backup and then you can restore all your data back to its original location with one click.



Windows 7 and 8.1 users will find a large number of updates waiting to be installed after reinstalling.

10. You'll be asked to verify your language, location and keyboard are set correctly, then it's a case of clicking Install Now. If prompted, enter your product key or click Skip if you're running Windows 10 on a PC you upgraded during the free period. When asked what type of installation you wish to perform, choose the Custom option.

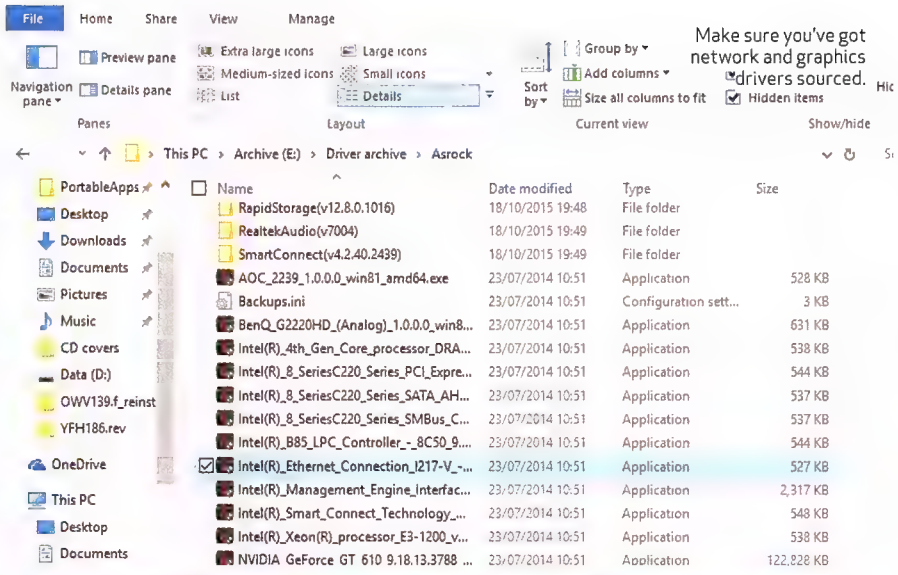
Next comes the trickiest part of the process. A list of drives and partitions will appear – you need to select the one Windows is currently installed on. By default, it should be detected and selected, but verify it's correct before clicking Format (click the advanced Drive Options button if it's not visible). Click 'OK', then once formatted, verify the drive is still selected and click Next. You'll see a checklist of tasks to be performed – sit back and wait. When Windows reboots, you may a 'press any key' prompt to boot from CD or DVD. Ignore and let the installer continue.

SET UP POST-INSTALL

The post-setup prompt begins with Windows 7 users being prompted for their product key, then it's a case of setting up a user account. Windows 8.1 users will get an Express Settings prompt – click the option to customise these and go through them carefully.

Post-Creators Update, Windows 10 no longer gives you an Express Settings option. For now, confirm your location and keyboard, set up your network if required and choose 'personal use' when prompted. You can either sign in with your Microsoft account or click 'Offline account' > 'Maybe later' if you plan to stick with the old-style Windows 7 local user account. If you opt for the Microsoft account option now is a good time to set up a PIN to speed up future logins (note: the PIN is tied specifically to this PC, and you can always bypass it using your regular account password should you forget it at any point). You'll then be asked to set up Cortana – this is where Windows 10's notorious privacy settings come into play, so review all of the options carefully, flicking the slider to Off for any you don't need or use.

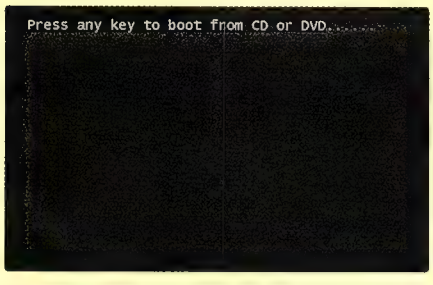
That's the end of the setup process – Windows will configure itself based on your choices and you'll see a series of messages appear on-screen. When all is ready, you'll find yourself back at the familiar Windows desktop screen of a fresher, faster, smoother-running PC.



Make sure you've got network and graphics drivers sourced.

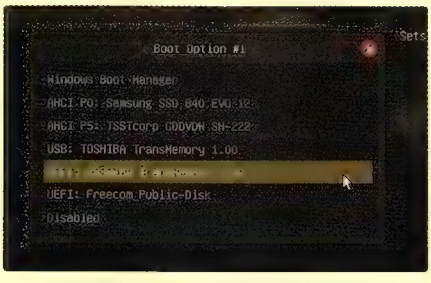
"Next comes potentially the trickiest part of the process. A list of drives and partitions will appear – you need to select the one Windows is currently installed on."

Start the install process



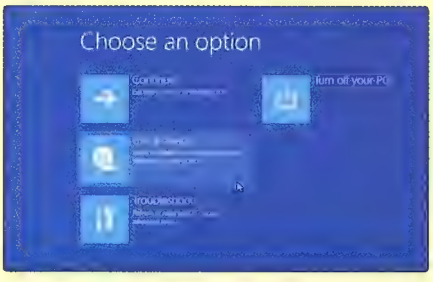
1 REBOOT FOR MEDIA

If you're running Windows 7, or have Fast Boot disabled, insert your boot media and start your PC. Look for a 'Press any key to boot from CD or DVD' option (even if you've booted from a USB flash drive) – press the key and you should find the Windows install process starts.



2 TWEAK BOOT OPTIONS

If you boot back into Windows, restart your PC again, but this time press a key, such as F11, when prompted to open a boot menu. Do so, select your boot media (choose UEFI if the option appears) to boot; otherwise, enter Setup to change the boot device order.



3 WINDOWS 8.1/10

If Fast Boot is enabled, open Settings in Windows and navigate to 'Update & recovery' > Recovery, then click 'Restart now' under 'Advanced start-up'. When the boot options appear, choose 'Use a device' to select your USB flash drive or DVD from the list.

Other reinstall options

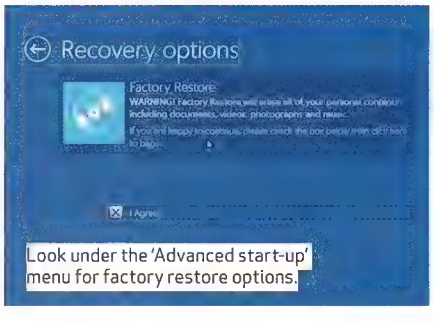
Get the lowdown on three further techniques: reinstall from a recovery partition, downgrade Windows and set up a dual-boot system

So far, we've covered both traditional reinstall techniques, but there are other reasons – and methods – for reinstalling Windows. First up is the recovery option. Most pre-built PCs come with a built-in manufacturer's recovery partition that enables you to restore Windows to its factory shipped condition. The main advantage of this method – aside from being cheaper and easier for the manufacturer, of course – is that your PC is restored to a guaranteed working state, with all the drivers it needs to function. The downsides are that a lot of extra unwanted software is usually installed alongside Windows, you need to exercise extreme caution not to lose everything on the drive, and that if the recovery partition corrupts – typically due to hardware failure – you're left with no means of reinstalling Windows.

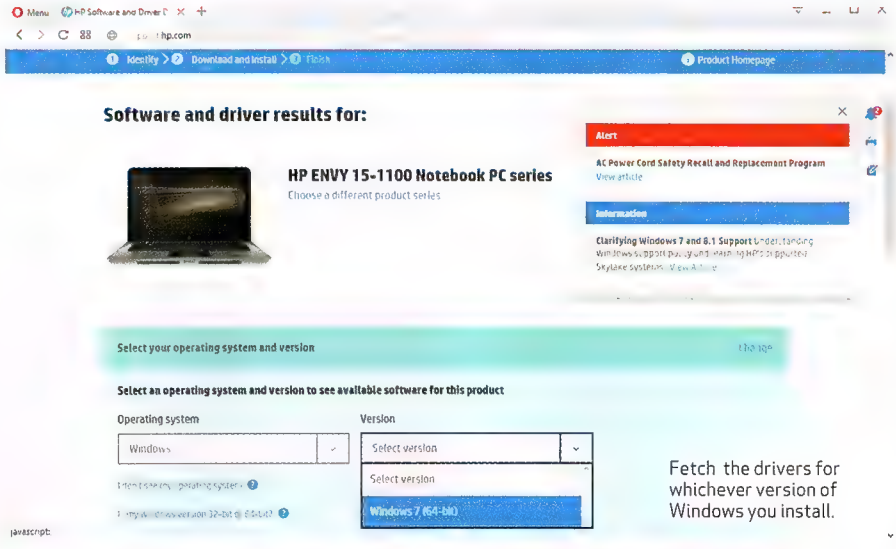
If you're planning to reinstall Windows by this method, look for a prompt to start recovery when you first boot Windows or look for the option under the 'Advanced start-up' menu (see below) – consult your computer's documentation or manufacturer's website for details. Remember that most recovery options are fully destructive, so be sure to have backed up your system before you begin – and that includes creating a complete drive image.

DOWNGRADE WINDOWS

Another reason to reinstall Windows is to revert to an earlier version. If you're pining for Windows 7 or 8.1, then it's usually possible to downgrade your copy of Windows – remember support for Windows 7 ends in January 2020, and Windows 8.1 in January 2023. Before reaching for your old Windows media, however, you need to do some homework first.



Look under the 'Advanced start-up' menu for factory restore options.


Software and driver results for:
HP ENVY 15-1100 Notebook PC series
Choose a different product series
Alert
AC Power Cord Safety Recall and Replacement Program
View article
Information
Select your operating system and version
Select an operating system and version to see available software for this product
Operating system
Windows
Version
Select version
Windows 7 (64-bit)

Fetch the drivers for whichever version of Windows you install.

"If you're pining for Windows 7 or 8.1, it's usually possible to downgrade your copy of Windows"

First, if you upgraded your PC to Windows 10 from an older version of Windows, restoring that version should be straightforward in the sense you can use your manufacturer's recovery partition if it still holds the original version, or you can try installing from an old, unused copy of Windows 7 or 8.1 – just follow the guides to preparing and reinstalling Windows earlier on in this feature. Do source the correct drivers for your PC first, though, and verify that your new software is backwards compatible (desktop apps should be, but Microsoft Store apps won't work in Windows 7, and some may not work in Windows 8.1 either).

If your PC came with Windows 8.1 or 10 preinstalled, then going back to Windows 7 will be trickier and possibly even impossible. Before embarking on this, check the web to see if others have had similar success. You'll need to source your own Windows 7 installation media and valid licence, and you'll almost certainly need to have access to your PC's UEFI settings – if Fast Boot is enabled, open Settings > 'Update & recovery' and click 'Restart now' under 'Advanced start-up'. When prompted, select Troubleshoot > Advanced Options > UEFI Firmware Settings.

Once inside your PC's UEFI settings you need to locate and change three settings. First, disable the Fast Boot feature. Second, disable Secure Boot. And finally, look for a CSM (Compatibility Support Module) option and make sure it's enabled. All three settings need to be made to support Windows 7 – if you can't find them, consult with your PC or motherboard manufacturer.

Once done, you should find you're able to boot from your Windows 7 installation media, enabling you to revert to the earlier copy of Windows.

SET UP A DUAL-BOOT PC

Our final scenario is one where you install two versions of Windows side-by-side. This is a step for advanced users only, and if you're merely planning to install an older version of Windows next to Windows 10 for compatibility purposes, explore alternative options, namely setting up a virtual Windows 7 machine using a tool such as VirtualBox (**www.virtualbox.org**), which runs inside your main Windows installation.

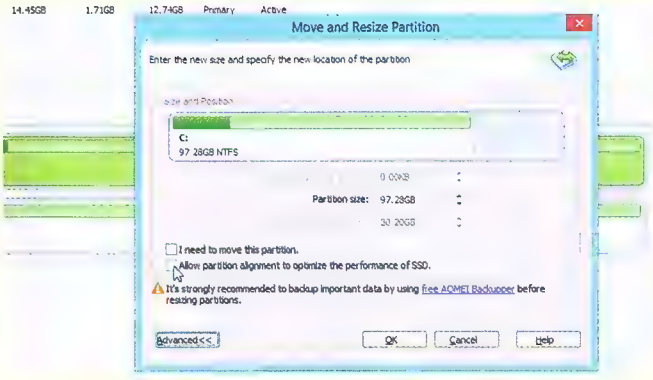
If you are determined to dual-boot your setup, the step-by-step guide on the facing page covers the process of installing an older version of Windows alongside your current one.

Set up a dual-boot PC

Make Bootable Media Wizard
Create WinPE bootable media
The program will help you make a bootable USB drive, Disc or a bootable ISO file.
Please select a way to make the desired bootable media, and then click "Proceed" to start.
USB Boot Device
TOSHIBA TransMemory (E:)
Export ISO File
Help
Add Drivers
Back
Proceed
Cancel

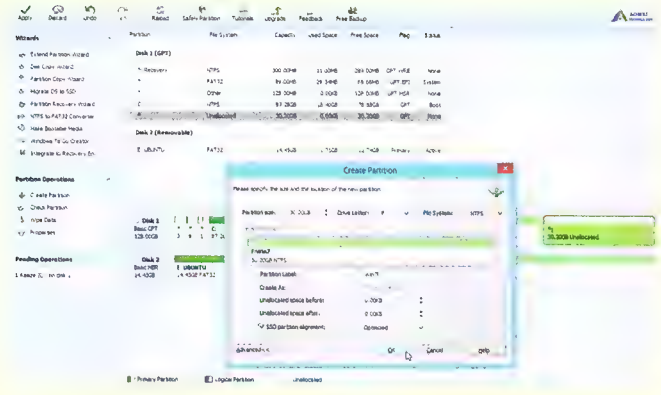
1 PARTITION HARD DRIVE

You'll need to partition your drive to free up space on which to store your copy of Windows. The best tool for the job is AOMEI Partition Assistant (**www.aomeitech.com/aomei-partition-assistant.html**). Start by clicking Make Bootable Media under Wizards to create rescue media.


Move and Resize Partition
Enter the new size and specify the new location of the partition
C:
97.28GB NTFS
Partition size: 97.28GB
I need to move this partition.
Allow partition alignment to optimize the performance of SSD.
It's strongly recommended to backup important data by using free AOMEI Backupper before resizing partitions.
Advanced<<
OK
Cancel
Help

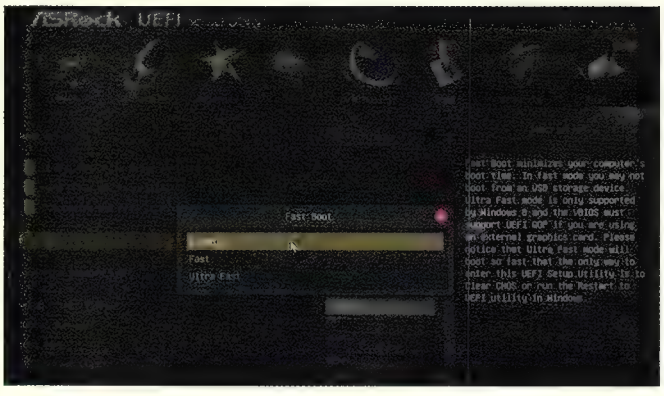
2 SHRINK MAIN PARTITION

Select your Windows drive (typically C:) and click Resize/Move Partition under Partition Operations. Use the slider to free up at least 30GB space to the right of the Windows partition. If your drive is an SSD, click 'Advanced>>' and tick 'Allow partition alignment…' Click 'OK'.



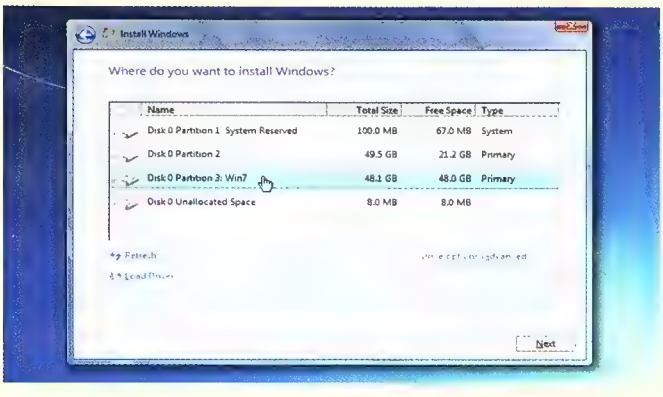
3 ADD NEW WINDOWS PARTITION

Now select the newly created Unallocated space to the right of drive C and click 'Create Partition' under Partition Operations. Verify NTFS is the file system and click 'Advanced<<' to give the partition a suitably descriptive label, such as Win7 before clicking OK. Click 'Apply' > Proceed and reboot.



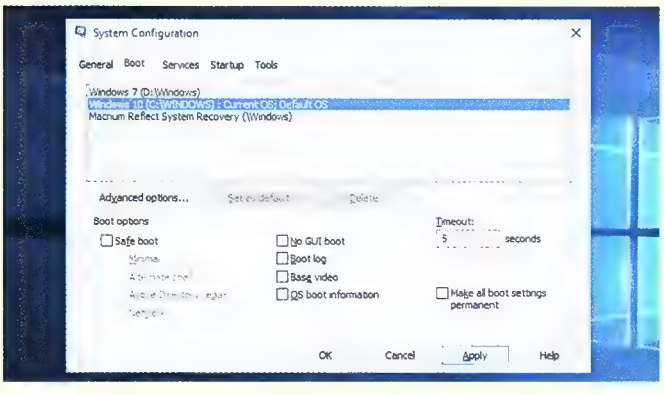
4 TWEAK UEFI SETTINGS

If installing Windows 7 alongside Windows 8.1 or 10, you may need to reboot into your UEFI (see the main text) to enable the Compatibility Support Module (CSM), plus disable Fast Boot and Secure Boot. Once done, you should be able to boot successfully from your Windows 7 installation media.


Install Windows
Where do you want to install Windows?
Name
Total Size
Free Space
Type
Disk 0 Partition 1 System Reserved 100.0 MB 67.0 MB System
Disk 0 Partition 2 49.5 GB 21.2 GB Primary
Disk 0 Partition 3: Win7 48.1 GB 48.0 GB Primary
Disk 0 Unallocated Space 8.0 MB 8.0 MB
Next

5 INSTALL NEW COPY OF WINDOWS

Once the new partition has been created (check in Windows), reboot using the installation media for your target version of Windows. The install process is almost the same as for a regular Windows installation, but be sure to choose the newly created partition as your target during installation.



6 POST-INSTALL STEPS

When Windows reboots for the first time you'll see a boot menu appear listing the different versions of Windows you have installed. If the 30-second delay is too long, or you want to change the default, Click 'Start' > Run, type msconfig and press [Enter], then make changes from the Boot tab. ■

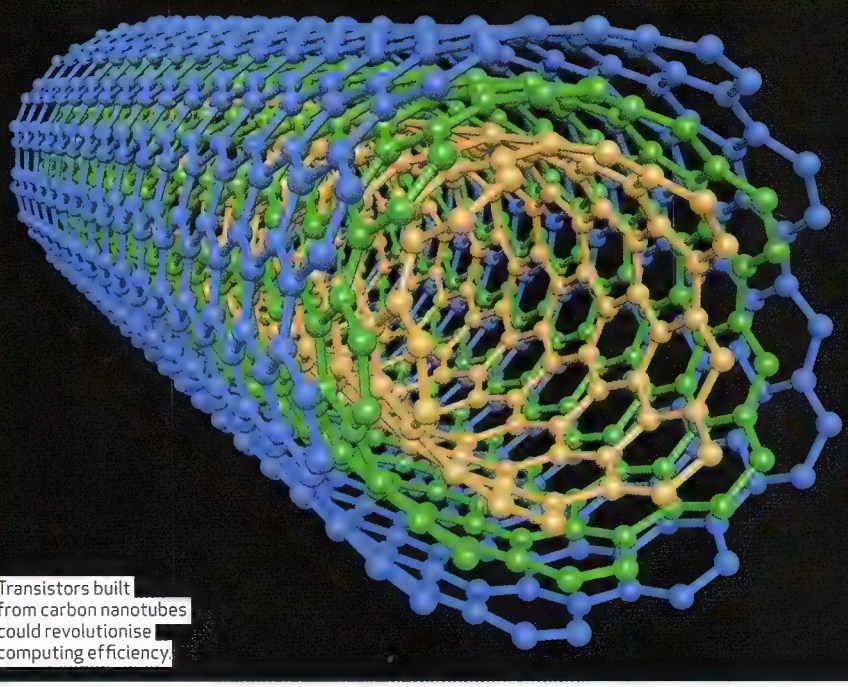
THE FUTURE OF COMPUTING, MOORE OR LESS

IT'S HAD A VERY GOOD RUN. BUT MOORE'S LAW IS DONE. DUSTED. AND DEAD. JEREMY LAIRD INVESTIGATES THE FUTURE OF COMPUTING IN THE POST-EXPONENTIAL ERA.

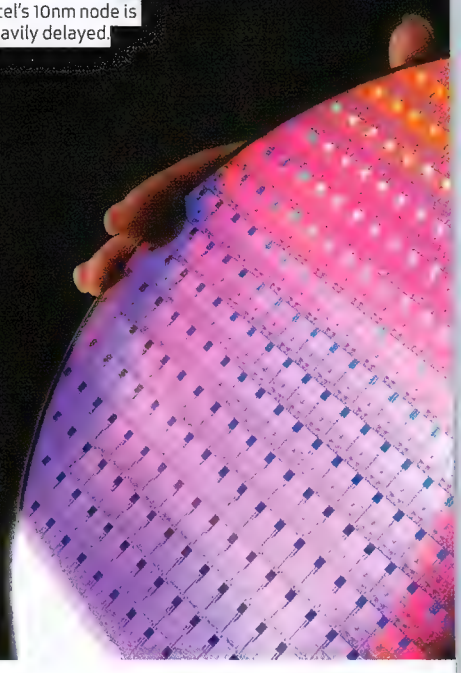
Fifty years is a long time for any prediction to hold true. It's an aeon when it comes to predicting the future of cutting-edge technology. But it's pretty much how long Moore's Law has held together as a predictor of progress in computing power. But now just about everybody agrees that Moore's Law is done. Computer chips are no longer doubling in complexity every two years. Intel's most recent roadmap update, to take just one example, pushed volume shipments of its next-gen 10nm processors out to 2019. That's almost five years after Intel began pumping out 14nm chips in significant volumes. Likewise, Intel's 14nm node came three years after 22nm. Welcome to the post Moore's Law era, where faster computing for less money is no longer an automatic assumption.

That's a radical change that could threaten progress well beyond conventional computing. Advances in everything from AI and self-driving cars to medicine, biotechnology, and engineering are all predicated, at least in part, on the assumption that available computing power increases not only reliably but exponentially. It's the latter implication that has been most revolutionary. The exponential increase in computing power for nearly 50 years was unlike anything the world had seen before. And it begs the question of whether we'll ever see anything like it again.

The simple answer is almost certainly no. The regular cadence of Moore's Law as it pertains to integrated circuit engineering is over, and there's no obvious candidate to replace it. The good news, however, is that there is no shortage of candidate technologies that could provide anything from incremental improvements to revolutions so radical they could render the very notion of increasing compute power redundant. The future of computing will no longer be a model of serene progress; it will very likely be measured in paralysing fits and dramatic starts.



Transistors built from carbon nanotubes could revolutionise computing efficiency.



No more Moore: Intel's 10nm node is heavily delayed.

The smartphone in your pocket is more powerful than room-filling mainframe computers of yore. Not just a little more powerful, but many orders of magnitude more powerful. That, in the proverbial nutshell, is Moore's Law, and its implications are as incredible in raw technical terms as they have been transformational for human existence. Almost every aspect of modern life is dependent, ultimately, on computing.

But Moore's Law is history, and the future of computing, if it is to advance, must rely on some other paradigm. Want specifics? The Apple iPhone X is capable of around 200,000 times more floating point operations per second than the CDC 6600 of 1964, considered by most to be the world's first supercomputer, and roughly the size of a pickup truck. Admittedly, that number involves a not exactly like-for-like comparison, which would involve numerous qualifications under close inspection, yet it gives an accurate sense of the monumental and exponential implications of Moore's Law, and the astonishing progress in computing power over the last 50 years.

Moore's Law, of course, is the observation that transistor densities in integrated circuits double every two years. Put another way, it says computer chips either double in complexity or halve in cost – or some mix of the two – every couple of years. Or rather, they did from around 1975, when Gordon Moore (co-founder of Intel) adjusted his original observational time frame down from doubling every year to two years, until roughly five years ago, when it became apparent that development had slowed.

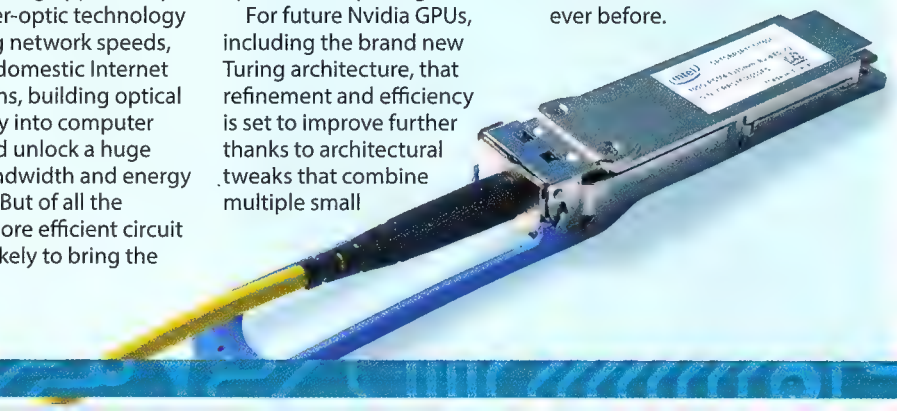
In 2015, Intel confirmed that the cadence of Moore's Law, as far as it was concerned, had slowed to 2.5 years with the transition from 22nm silicon chip production to 14nm. Fast-forward to the second half of 2018, and it's clear that Intel's step from 14nm to 10nm will require even longer – at least four years, probably getting on for five. The other major players in chip production, including Taiwanese giant TSMC and South Korea's Samsung, have all suffered their own delays. The upshot of which is a

IF NOT QUANTUM COMPUTING, THEN WHAT?

Moore's Law is dead and quantum computing isn't coming to the rescue. Although, not any time soon. So, is there anything that can keep conventional computing moving forward? One promising technology is carbon nanotubes, one of those wonder technologies with seemingly infinite possible applications, from space elevators to solar cells. But how can they help computing? One of the key theoretical advantages of transistors built from carbon nanotubes could be much lower power consumption. That would allow for more powerful chips to operate within the limited energy budget of a device like a smartphone. Physically, it's easy to fit a desktop-class CPU die inside a smartphone. Powering it is the problem, and carbon nanotubes might solve it.

Optical interconnects both between and within chips are another big opportunity. Just as fiber-optic technology is boosting network speeds, including domestic Internet connections, building optical technology into computer chips could unlock a huge leap in bandwidth and energy efficiency. But of all the options, more efficient circuit design is likely to bring the most immediate benefits to compute power. Graphics chips are a handy yardstick, here. Already, Nvidia's GPUs are significantly more efficient in terms of overall graphics rendering performance per unit of die area than AMD's competing graphics chips. That's thanks to better optimised chip design.

For future Nvidia GPUs, including the brand new Turing architecture, that refinement and efficiency is set to improve further thanks to architectural tweaks that combine multiple small operations into a single larger operation. AMD is taking a similar approach with its Rapid Packed Math technology in the latest Vega GPUs, even if it remains behind for overall efficiency. With Moore's Law consigned to history, that kind of optimised chip design will be more critical than ever before.



D-Wave's 2X is the real, quantum-computing deal. But is it actually faster than conventional computers?

consensus that the Moore's Law that pertained for around four decades is no longer.

Not that this is a surprise. The very nature of conventional integrated circuits guarantees the cadence of ever-shrinking transistors can't go on forever. The approach was sure to bang up against the limitations of matter eventually. Once you're making transistors from a handful of atoms, you've nowhere left to go.

The demise of Moore's Law isn't the only challenge facing conventional computing based on integrated circuits. As a happy corollary to increasing chip complexity, the shrinking proportions of transistors have been accompanied by an increase in the rate at which they can be switched on and off, and likewise a reduction in per-transistor power consumption. Combine the two, and you have both increased operating frequencies and reduced energy consumption per unit of compute power. That's pretty much a free lunch in computing terms, and it's been just as important for progressing overall performance as raw transistor density.

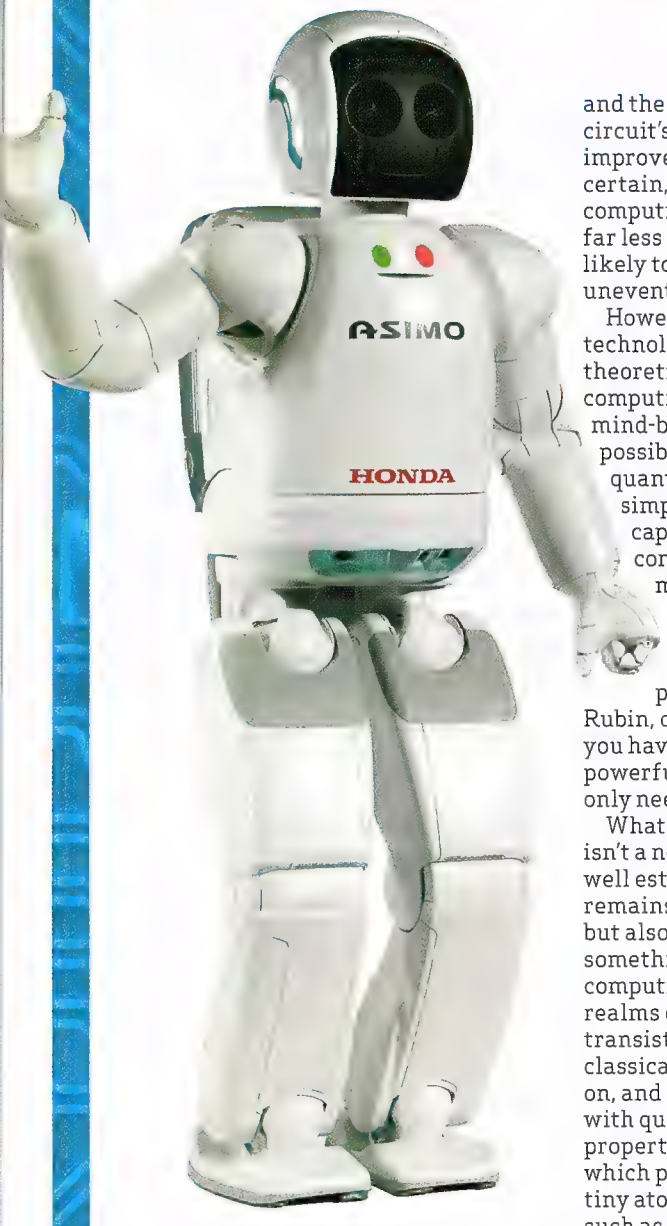
Unfortunately, improvements in operating frequency and energy efficiency have been even shorter lived than Moore's Law. In 2004, Intel hit 3.8GHz with its Pentium 4, and talk was of 10GHz computing. Nearly 15 years later, the sustainable clock speeds of its processors have improved by scarcely 1GHz. More recently, current leakage has become an increasing problem as transistors have grown smaller. Small enough, in fact, to find themselves hostage to quantum-level physical phenomena, such as quantum tunneling, which allows individual electrons to effectively leap across insulation barriers and thus "leak" energy and generate heat. The impact of that alongside the slowing of Moore's Law is profound. Where once it could be assumed that computer chips would get faster, more efficient, and cheaper, all at the same time, it's no longer possible to be confident about substantial gains by any of those metrics.

But is it that big a problem? After all, when it comes to desktop computing, many argue today's CPUs are already powerful enough. The extent to which PC processor performance has stagnated in recent years has also had at least as much to do with a lack of competition as the wheels coming off Moore's Law. Observe the impact AMD's Ryzen CPUs had on Intel. The latter stuck with four cores for mainstream desktop chips for around a decade, but a year after Ryzen appeared, Intel is launching eight-core models for its mainstream socket, has 18-core enthusiast chips already, and plans to up that to 28 cores in the near future.

Of course, all that involves a rather CPU-centric view of the universe. Other areas of computing remain predicated and reliant upon something at least close to Moore's Law rumbling on. True desktop computing power in a pocketable device isn't going to happen without substantial further progress, for instance. Ditto photorealistic computer graphics rendered in real time. However, it's the technologies that promise the most wide-ranging impact on human life, including AI, robotics, machine learning, and biotechnology, that have most to lose from the demise of Moore's Law. The scope and range of those endeavors will be curtailed if advances in compute power stall with the demise of Moore's Law.

But what can replace Moore's Law and drive computing power forward? The good news is that numerous candidates exist. Indeed, some industry observers think the death of Moore's Law is long overdue. In recent decades, the assumption that ever more conventional compute power will become available has arguably made software developers lazy, and stymied research into alternative computing hardware paradigms. Why put in effort and money, when cheaper, faster computer chips are sure to solve the problem? With Moore's Law no longer, the impetus to develop alternatives is far more compelling.

The bad news: There's probably no single technology, idea, or approach that will directly replace Moore's Law



AI, robots, or self-driving cars—the future depends on increasing compute power.

and the conventional integrated circuit's incredible capacity for self improvement. If one thing seems fairly certain, the future progress of computing will be far less predictable, far less regular. Instead, progress is likely to come in sharp leaps after uneventful lulls.

However, if there is a single technology that offers the biggest theoretical upside, it's quantum computing. Its raw potential is mind-boggling. Long story short, it's possible to conceptualise a single quantum computer of remarkable simplicity and efficiency that's capable of not just matching the combined number-crunching muscle of all existing computers, but also executing essentially as many calculations at once as is practically useful. As Andy Rubin, of Android OS fame, said, "If you have computing that is as powerful as this could be, you might only need one [computer]."

What's more, quantum computing isn't a new idea, and its core premise is well established and understood. Yet it remains not just thoroughly exotic, but also controversial. The basics go something like this: Conventional computing operates in the binary realms of zeros and ones, aka bits. A transistor, the basic component in a classical computer, is thus either off or on, and nothing in between. Not so with quantum computing. Thanks to a property known as superposition, which prevails when dealing with very tiny atomic and sub-atomic particles, such as individual electrons, it's possible for a quantum computing bit to be not just on and off at the same time, but also a huge array of what you might call hybrid superpositions in between on and off. This is a qubit, and it's the basic building block of quantum computing.

But the qubit's incredible, peculiar, and non-binary capacity isn't the whole story. It's the way qubits can interact with each other, thanks to another quantum property, that enables the real computational fireworks. Welcome to the weird and wonderful world of quantum entanglement. The concept is tricky for even highly qualified physicists to truly grasp, let alone us mere mortals, but it involves the notion that quantum mechanical properties, such as "spin," of two or more particles can be inextricably linked, even if separated by great distances. Change the spin of one particle, and others instantly react, regardless of the distance between them.

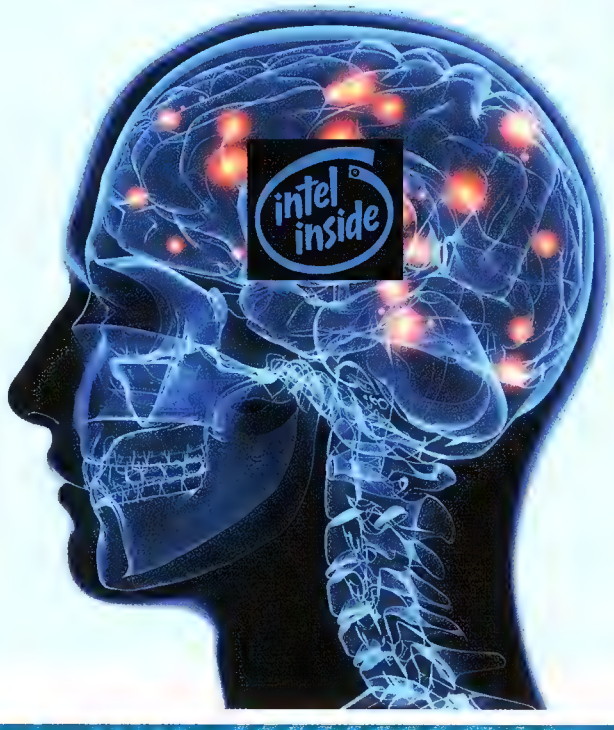
So, the trick to achieving really powerful quantum computing is to entangle multiple qubits. Quantum-mechanically link or entangle two qubits, and you can perform two calculations simultaneously. Link three qubits, and two to the power of three calculations – a total of eight – are possible. Link four, and you can perform 16 calculations simultaneously. Keep on going, and when you hit 300 entangled qubits, you can perform more calculations in parallel than there are atoms in the known universe. That's a lot of calculations – enough, in theory, to solve pretty much any computational problem you can imagine. In practice? Not so much. At least, not yet. Earlier

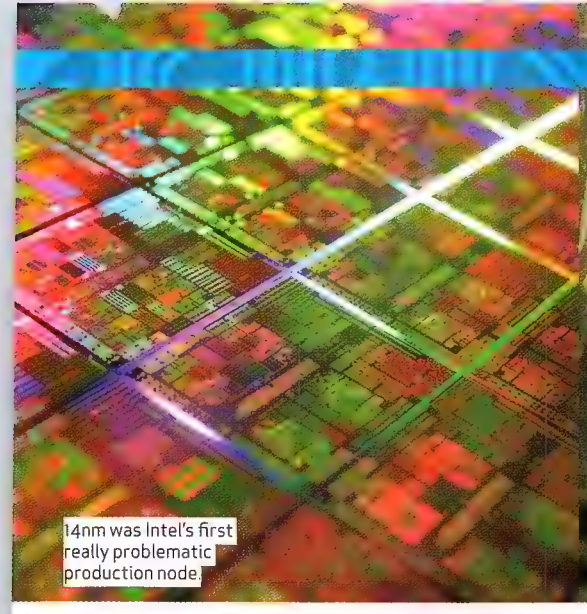
A LITERAL BRAIN BOX

Our brains are thought to be made of around 100 billion neurons, while the biggest computer chips top out at tens of billions of transistors. Meanwhile, each neuron can be connected to as many as 10,000 others, making for up to 1,000 trillion synaptic connections. By some metrics, the human brain is equivalent to a 1 trillion bit-per-second computer. Add to that the fact that the brain's peak power consumption is around 20 watts, and that makes the brain 10,000 times more efficient than the best integrated circuits.

Hold that thought while we consider another. Thanks to the increasingly power-hungry nature of computer chips, plus the rising cost of energy, it's more expensive to run a server for a few years than to buy it. Both in terms of increasing compute density and making it affordable to use, a big increase in efficiency would go a long way. The advanced micro-integration group at IBM's research lab in Zurich thinks the brain has the answer – or rather, the brain's fractally branching network of blood vessels makes for a very interesting model.

IBM is working on in-chip microfluidic channels that supply power and enable cooling. The idea functions like a flow battery, in which power is provided by two liquids that produce electricity when meeting on either side of a membrane. If the idea works, it'll be useful for 3D chips with multiple layers of integrated circuits.





14nm was Intel's first really problematic production node.

Try rendering *Crysis* on a CPU and you'll soon understand the benefits of single-purpose chips.

this year, physicists at the University of Science and Technology of China set a new record by achieving quantum entanglement with 18 photon-based qubits. But the rate of progress in achieving that number has been painstaking, and there are no signs of it taking off any time soon.

The problem is that the superpositions of qubits are very fragile. Tiny amounts of heat or magnetic interference can cause them, in effect, to collapse. Building a quantum computer is therefore far from easy. What begins with a relatively simple network of notional qubits quickly turns into a complex machine utilizing liquid-helium cooling down to a fraction of a degree above absolute zero, surrounded by heavy-duty magnetic shielding.

What's more, while commercial computers that exploit these quantum-level effects are available, they're not only limited physically by the need for intense cooling and shielding, but also limited in computational scope. The space inside a D-Wave 2X, one of the most commercially successful quantum computers available, is mostly given over to a liquid-helium refrigeration system capable of cooling its qubits down to just a fraction of a degree above absolute zero, while much of the remaining machine is made up of magnetic shielding that protects the qubits from fluctuations in Earth's magnetic field.

Despite all that technology and innovation, the D-Wave 2X's computational prowess is restricted to finding the lowest value of complicated functions. Granted, such calculations can be very useful in engineering, which is why Google, NASA, and Lockheed Martin are all reportedly D-Wave clients, but such a machine hardly makes for a promising candidate technology for future pocket computers. Indeed, for a while, there was some controversy whether D-Wave's computers really were quantum. That has now been firmly established in the affirmative, but debate remains whether D-Wave's technology is actually any faster than a conventional computer, even for the narrow computation of which it is capable. Some even view the whole field of quantum computing as an irrelevance, equivalent to the alchemist's quest to turn base metal into gold. Like quantum computing, that is indeed possible with today's technology. But not to a degree that it's actually useful.

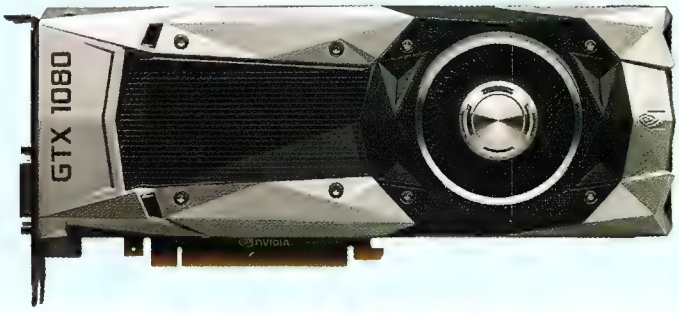
So, in the short to medium term, quantum computing isn't going to step in where Moore's Law left off. Instead, what progress there is will come from a complex array of technologies, including not only quantum computing, but also biological analogs, a shift to cloud computing, more efficient circuit design, and dedicated chips built to do one thing really well (see boxouts). In the meantime, if there's a take-home lesson, it's that Moore's Law has run its course, and the next 50 years of computing will be very different from the last 50. Whether they'll be better or worse, only time will tell.

TODAY'S TECHNOLOGY, TOMORROW

While the temptation is to seek out radical new tech, a little lateral thinking can go a long way. Take cloud computing: Who needs faster phones when you can push the heavy lifting into the cloud? That's happening with services like Google Maps, where elements like routing are calculated on Google's servers. So, accelerating smartphone performance may be more dependent on improving network coverage and speeds than creating faster processors.

Dedicated circuits or chips are another example. Again, the idea is already in use. Imagine rendering a modern PC game purely on a CPU rather than a graphics chip, and you'll get an idea of how much more efficient a chip designed to do one thing well can be. If that approach can be combined with efforts to improve power consumption, it's possible to imagine PCs and even smartphones with numerous dedicated circuits or chips, each able to perform a single task far faster than any PC can today. If that's not possible, combine dedicated chips with the idea of pushing computing into the cloud, and you get the same result: more performance.

Of course, dedicated chips can be expensive to produce, which is why so-called programmable chips may have a bigger role to play. The idea behind such chips, known as field-programmable gate arrays (FPGA) is to create a chip that can be reconfigured on the fly. Made up of a matrix of configurable logic blocks connected via programmable interconnects, FPGAs are a sort of compromise between a general-purpose CPU and a fixed-function dedicated circuit. ■



System News

Sales events are great, but Mark Williams knows a way of always finding the best deal on PC hardware.

SALE! It's the word that shops just love to plaster on all their marketing in emails, pamphlets, signage and in online stores. It triggers potential customers into looking closer, enticing them to slowly reach for their wallets. And with good reason; there's money to be saved and bargains to be had!

For the retailer, there's an obvious fine line between how much of a discount you give versus how much of an uplift in sales it generates. A friend of mine recently bought himself all the parts for a new PC he wanted to build and jumped in during a big sales event. I was pleasantly surprised at what he was able to build for the money: i5-8400, B360 motherboard, 16GB RAM, RX580 8GB, 256GB SATA SSD, 2TB HDD, H500 case and a 750W PSU. At the time of writing that would amount to essentially a $1,500 build. Thanks to the sales that were on though, $50 was saved on the graphics card and a further $100 was saved on the CPU/RAM/Motherboard combo. The $150 in total savings brought the actual cost to basically $1,350, a full 10% off the entire build. Impressive! Especially at the low $1,000s price point where edges start to be cut, and hard decisions made.

Going back to the seller's point of view, that effective 10% cut in sales price of a system build represents a cut to margins and thus profits. To counter this, retailers need to shift a lot more units to compensate, and this is where the sales start to work their magic. Jaimie from Leader Computers informed us that "we see a massive uplift in business from our large online retailers during the Black Friday and Cyber Monday period, approximately 15-20% for the ones who actively market during these sales".

As you can see, the 10% loss in profit comes with a 15-20% increase in sales so they come out ahead thanks to the increased buzz from the sales event. It also presents the opportunity to get rid of ageing stock and to gain new customers. It's a win-win for everyone!

You can of course win even more so by shopping around for the best deals. This is where one of my favourite websites comes into play, staticICE (**http://staticice.com.au**). This Australian website is basically a search engine for computer parts prices and some other consumer tech like cameras, phones and headphones for example. Just type the name of the part/item you're interested in and immediately get results sorted by price.

This site has been around since 2004 and surprisingly still looks and functions the same. With almost 200 Australian retails being searchable this offers a very quick and powerful way to find out where not only the best prices can be had but you can use it to build a picture of which retailer has most, or all, of what you're after at the best overall price.

For example: searching for the Intel i7-9700K, shows an amazing $174 difference between the cheapest and most expensive sellers!

The next time you're looking for parts, be sure to shop around and if possible, line-up your purchase with EOFY or Christmas or other sales periods to maximise your savings.

"We see a massive uplift in business from our large online retailers during the Black Friday and Cyber Monday period, approximately 15-20% for the ones who actively market during these sales"

SHOP TALK

How important are sale events for your business, and what sort of benefits do you get from them? What size is the uptick in sales you see during these periods?

Jaimie Ianson, Leader Computers:

"At Leader we see a massive uplift in business from our large online retailers during the Black Friday / Cyber Monday period, approximately 15-20% for the ones who actively market during these sales. It is an excellent opportunity for them to move ageing stock and gain new customers.

Not all of the retailers take advantage of the sales, but we find the ones who participate normally do very well. At Leader our aim is to keep our resellers growing and profitable. Sales like these are the ultimate time for the online retailers to get vendor support to move both exciting new products and ageing lines, which can help their business grow in multiple ways.

We definitely encourage our resellers to get involved. End of financial year is still the strongest [sales period] in general, with Christmas right behind it. With quarterly BAS these days EOFY has less impact than it used to though. December is usually a very strong month for us both in retail and also the server space as many companies refresh their hardware over the holiday break, and education also gears up for their refresh cycle."

Market Watch

Mark Williams assesses a sampling of PC systems available this month.

Aftershock PC Impulse

$1,278 TINYURL.COM/APC463-SHOCK

With the physical volume of a shoebox, this ITX system packs a lot into a small space. The CPU is the bare minimum for gaming but when matched with low end cards like the included GTX 1050 Ti it won't be bottlenecking performance.

The GTX 1050 Ti is good for 1080p gaming in esports or other lightweight games like Fortnight. Although if you want to be able to run Triple-A titles with maximum graphical details, consider opting for the GTX 1060 6GB at checkout. 8GB of RAM is good for this use case, and the SSD + HDD combo offer good mass storage capacities for the price.

KEY SPECS: CPU: Intel Core i3-8100; Cooler: OEM; Motherboard: Asrock H310M ITX/AC; Graphics: Nvidia Geforce GTX 1050 Ti 4GB; Memory: 8GB DDR4 2666MHz; Storage: 512GB M.2 SATA SSD, Toshiba 1TB 2.5in 5400rpm HDD; Power Supply: FSP 450W SFX; Case: Impulse V2

PLE Computers Home Ryzen APU Force

$809 TINYURL.COM/APC463-PLE

Looking for a basic home PC? This system aims to fill that need. At the heart of this system is a Ryzen APU. A quad-core CPU with the best integrated graphics processor currently available, meaning it actually has some gaming chops (RX 550 performance levels) if you'd like to game on the cheap.

The memory and mass storage are a little disappointing, though. The OS drive being a HDD is a little passé. If space isn't of concern, a 240GB SSD can be selected instead, at no extra cost, which we highly recommend.

The 4GB of memory is the bare minimum for light tasks. If gaming or any multitasking is on the cards, the $54 upgrade option to 8GB of faster 2666MHz RAM would be money well spent.

KEY SPECS: CPU: AMD Ryzen 5 2400G; Cooler: Wraith Stealth; Motherboard: Asus Prime A320M-E; Graphics: Onboard (Radeon RX Vega 11); Memory: GeIL 4GB DDR4 Pristine C16 2400MHz; Storage: WD Blue 1TB 7200RPM HDD; Power Supply: eVGA BV Series 450W; Case: Deepcool Tesseract

Arrow Computers Arrow Predator

$2,599 TINYURL.COM/APC463-ARROW

While marketed as a gaming PC, this would not appear to be the best use case for this system. Sure, it'll happily play all games at high detail at 1080p (only), however, this system is bottlenecked by the decidedly mid-range GPU.

The CPU on the other hand is overpowered for the paired GPU in gaming tasks. Given the $900 price of the CPU alone, this system should only be considered if you'll regularly use all of the speedy 8-cores and 16-threads this processor offers. Perhaps for rendering, video production or transcoding, virtual machines, etc. Just for gaming alone, this system is overpriced as a result.

KEY SPECS: CPU: Intel Core i9-9900K; Cooler: Unknown; Motherboard: Unknown; Graphics: Nvidia GeForce GTX 1060 6GB; Memory: 16GB DDR4 2400MHz; Storage: 480GB SSD, 2TB HDD; Power Supply: 700 Watt; Case: Axceltek GL-100

Mwave S54a Gaming PC - GTX 1070 Ti Edition

$2,099 TINYURL.COM/APC463-MWAVE

Looking for a sweet spot PC that provides the best value for your hard-earned cash? This ticks all the boxes. The CPU offers 12-threads of compute performance, at a price some $260 cheaper than Intel's lowest 12-thread option! (i7-8700) Unbeatable value. The GTX 1070 Ti also offers solid performance, good for 1440p gaming or 144Hz refresh rates at 1080p. Offering up essentially GTX 1080 performance, it's a perfect pairing.

RAM, SSD and HDD storage capacities are also generous. Good to see fast RAM is being used too, Ryzen loves that. A great system for the price.

KEY SPECS: CPU: AMD Ryzen 5 2600; Cooler: Wraith Stealth; Motherboard: X370 based; Graphics: Nvidia GeForce GTX 1070 Ti 8GB; Memory: 16GB DDR4 up to 3000MHz; Storage: 500GB M.2 SSD, 2TB 7200RPM HDD; Power Supply: Unknown; Case: Unknown

PC blueprints

The *APC* team's picks for a part-by-part perfect PC build to suit your budget.

PARTS LIST

PART		PRICE
CASE	BITFENIX NOVA TG	$69
PSU	450W CORSAIR CX450	$69
MOBO	ASROCK AB320M-DGS	$78
CPU	AMD RYZEN 3 1200	$145
GPU	GIGABYTE GEFORCE GTX 1050 2GB	$199
RAM	8GB (2 X 4GB) KINGSTON HYPERX 2666MHZ	$129
SSD	120GB ADATA ULTIMATE SU650 2.5-INCH SSD	$59
HDD	1TB SEAGATE BARRACUDA ST1000DM010 HDD	$65
OS	UBUNTU DESKTOP LINUX 18.04 LTS 64-BIT	$0
APPROXIMATE PRICE:		$813

No changes. There's been very minor price drops this issue in our budget build, making the same box a barely worth metioning $3 cheaper. There's little we'd change here: The Ryzen 3 1200, although last-gen, is a strong entry-level processor, and the AB320M-DGS with a BIOS upgrade will happily support any Ryzen 2 part, if you're interested at a later date. The one thing we're not super-happy with is the GPU. Gigabyte makes some mighty fine cards, but Nvidia's GTX 1050 GPU is just not powerful enough for our 1080p aspirations. The difference between that and the GTX 1060 3GB is staggering, and worth the extra $60–$80 if you can stretch that far. If gaming isn't your thing, you could forsake the GPU, and replace the Ryzen 3 1200 with a Ryzen 3 2200G. Its integrated graphics will be able to drive your everyday content at 1080p just fine. Just bear in mind you'll struggle with more demanding graphical tasks.

PARTS LIST

PART		PRICE
CASE	FRACTAL DESIGN MESHIFY C	$129
PSU	550W EVGA SUPERNOVA 550 G3 80+ GOLD	$149
MOBO	ASUS ROG STRIX B450-F GAMING	$209
CPU	AMD RYZEN 7 2700	$379
COOLER	CORSAIR HYDRO H100I PRO 240MM RGB AIO	$160
GPU	GIGABYTE GEFORCE GTX 1070 TI	$649
RAM	16GB (2 X 8GB) G.SKILL RIPJAWSX 2133MHZ	$219
SSD	250GB SAMSUNG 970 EVO M.2 PCIE SSD	$138
HDD	1TB SEAGATE BARRACUDA ST1000DM010 HDD	$65
OS	WINDOWS 10 HOME 64-BIT OEM	$140
APPROXIMATE PRICE:		$2,237

No changes to the mid-range, either. Intel may be stretching its legs in this market segment, but it just doesn't hold that value position right now, and that's a biggy for us. We've always been about maximum power—it can be as expensive as you like, but if it's not good value at that price, it's time to throw it out. We're still waiting to see a 9th-gen Core i5 sample from Intel, so for the time being, we're sticking with our Ryzen 7 2700. It's a fantastic processor, especially for those into overclocking, and AMD's Ryzen Master software makes the job a cinch, and is something we regularly turn to if we can't be bothered to keep booting back into the BIOS. The GTX 1070 Ti also provides a fantastic amount of performance for the price still—expect an easy 60fps at 1440p across most titles. It's a little like a refined GTX 1080, just using lower-spec memory, and with a few more CUDA cores disabled.

UPGRADE OF THE MONTH

Phanteks Enthoo Evolv X Glass

$299, WWW.PHANTEKS.COM

Sometimes, it's not about power or the experience, it's about appearance. If you've got a raggedy old case that could do with an update, there's no better chassis out there right now than the Evolv X. This evolutionary icon is nothing short of awe-inspiring, with extensive cooling support, dual system compatibility, sophisticated RGB LEDs, and enough clever touches to make building in it a dream.

Head to Pinterest, PC Part Picker, or Instagram, type in "Evolv X," and you'll see all manner of gaming setups featuring a Phanteks Evolv, and for $300, what have you got to lose? We'll be using our sample in an upcoming liquid-cooled behemoth, featuring an RTX 2080 Ti and a whole heap of EKWB parts. That said, it's equally at home with air cooling, server rigs – with its massive 19 supported hard drive bays – or casual gaming.

> "The 2970WX does take some tweaking to get it running right; it doesn't have immediate plug and play capability, and that's a big deal for us."

It looks like we don't have any major changes to our Turbo build this issue, either. The ones we have tweaked – PSU, GPU, and RAM – are all just variants of ones we had last issue. We've opted for a $10 more expensive Corsair RM power supply, the white variant, as it comes with pre-sleeved white cables; a 32GB kit of RGB Trident Z memory at 3200MHz, as opposed to last issue's 3000MHz (no longer available at that price); and the RTX 2080 has transformed into a Gigabyte variant, again with a white color combo to match the PSU, cables, memory (if configured), and mobo.

There's a few obvious changes we could have gone for. The 24-core Threadripper 2970WX, for instance, would be an obvious contender, but because it's more of a workstation part, as opposed to a gaming or mainstream part, we're reluctant to recommend it, because these builds are designed around that all-arounder principle. The 2970WX does take some tweaking to get it running right; it doesn't have immediate plug and play capability, and that's a big deal for us. Storage is pretty strong here, though, as is the cooling. One thing we would recommend on that front is potentially investing in a bit of extra case fan cooling, because both the RTX 2080 and the 2950X can punch out some serious heat. In hotter parts of the country, that may be a necessity.

PARTS LIST

PART		PRICE
CASE	NZXT H700I	$173
PSU	CORSAIR RM750X WHITE 750W GOLD CERTIFIED **NEW**	$199
MOBO	ASUS PRIME X399-A	$399
CPU	AMD THREADRIPPER 2950X	$1,415
COOLER	ENERMAX LIQTECH TR4 II 240MM RGB AOI	$140
GPU	GIGABYTE GEFORCE RTX 2080 GAMING OC **NEW**	$1,299
RAM	32GB (4X 8GB) G.SKILL TRIDENTZ RGB 3200 **NEW**	$861
SSD	512GB SAMSUNG 970 PRO M.2 NVME	$200
HDD	2 X 2TB SEAGATE BARRACUDA ST2000DM006	$120
OS	WINDOWS 10 HOME 64-BIT OEM	$140
APPROXIMATE PRICE:		$4,946

Ray-Traced Threadripping

Alternatively, you could call this issue's build "How to Make Threads and Alienate People".

The latter half of this year has seen some seriously cool hardware launches. Whether or not the prices are right, or the technology warranted, it's hard to deny that compared to the past few years, it's definitely an interesting time to be a tech enthusiast. Whether we're talking about AMD throwing out the rule book when it comes to mainstream core counts, Nvidia dicing with new forms of rendering, taking what are otherwise enterprise grade components and baking them into gaming hardware, or Intel adjusting its own core count and redeveloping its TIM to compensate, compare the last six months to the previous three years, and there's no shortage of things to write home about.

So, what did we decide upon this time around? What's the concept? A modern-day streaming rig, designed to futureproof you for the next couple of years or more. For us, that means two things: a big budget, and a hell of a lot of cores.

There's no doubt that streaming has exploded over the last few years. Those once prestigious "let's play" videos have turned into live streams with incredible audience interaction, and to simultaneously play games, compress and upload that all to Twitch, and run background applications in a timely manner requires a lot of raw processing prowess. It's a money-maker, that's for sure, at least if you're committed, and have the time to do so.

"There's no doubt that streaming has exploded over the last few years. Those once prestigious "let's play" videos have turned into live streams with incredible audience interaction."

PARTS GALORE

With all that in mind, our processor of choice for this was AMD's Threadripper 2950X. Now pitched as the go-to gaming CPU for the high-end budgeteer, this beauty packs 16 cores, 32 threads, a supersized portion of PCIe lanes, and compared to the last-gen 1950X Threadripper, a lot of memory optimizations to make gaming even better in contrast to its Intel counterparts.

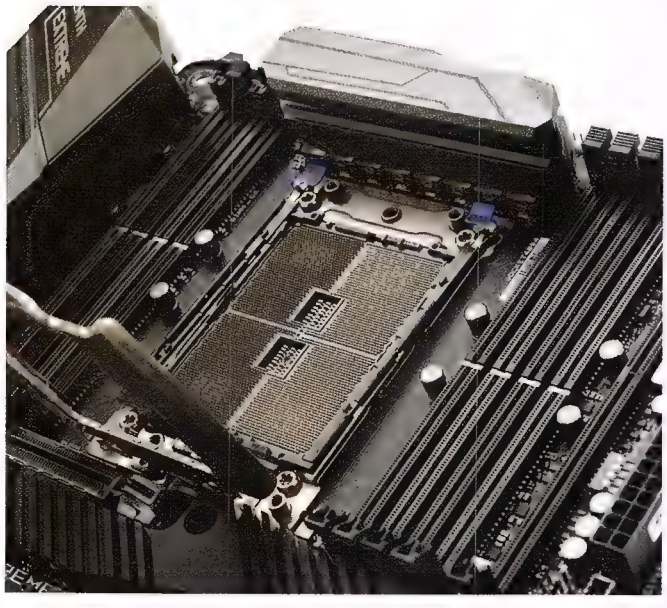
That aside, the main aim of our rig is to game at 4K, and as the resolution increases, CPU load decreases. For our GPU, we've gone with the latest Asus GeForce RTX 2080 ROG Strix Gaming OC – what a name, right? It's not at the top of the RTX pile right now, but for $1,600 it certainly packs a punch, and with DLSS hopefully right around the corner, that investment into those tensor cores could make a huge difference when it comes to the graphics processing leveraged on the antialiasing. With 1080 Ti performance on top of that, it's an ideal combo for any budding streamer, as long as you've got the cash to back it up, and don't mind forking out extra for those shiny new features. If that's not for you, you could just grab a GTX 1080 Ti while they're still hot.

For memory and storage, we've gone for 64GB of G. Skill Trident Z @ 3,200, and a single 1TB Crucial P1 M.2 PCIe SSD. The latter is an incredibly affordable NVMe solution, and although it doesn't have quite the same clout as a 970 Evo when it comes to sequential writes, the reads are very similar, and it's difficult to argue with the price.

The other interesting choices we've gone for are the Be Quiet! Dark Rock Pro TR4 Edition cooler, a super-budget 250W TDP displacing air tower, designed specifically for the big T, and the Silent Base 610 non-windowed, noise-dampened chassis, which comes in at a modest $189.

PARTS LIST

PART		STREET PRICE
CASE	BE QUIET! SILENT BASE 601 MIDI TOWER	$189
MOTHER-BOARD	ASUS ROG ZENITH EXTREME	$689
CPU	AMD THREADRIPPER 2950X	$1,415
CPU COOLER	BE QUIET! DARK ROCK PRO TR4	$119
GPU	ASUS GEFORCE RTX 2080 8GB ROG STRIX GAMING OC	$1,599
MEMORY	64GB (4X 16GB) G.SKILL TRIDENT Z @ 3,200MHZ	$1,159
PSU	1,200W CORSAIR HX1200I PLATINUM	$290
STORAGE	1TB CRUCIAL P1 M.2 PCIE SSD	$331
OS	WINDOWS 10 64-BIT	$140
TOTAL		$5,931

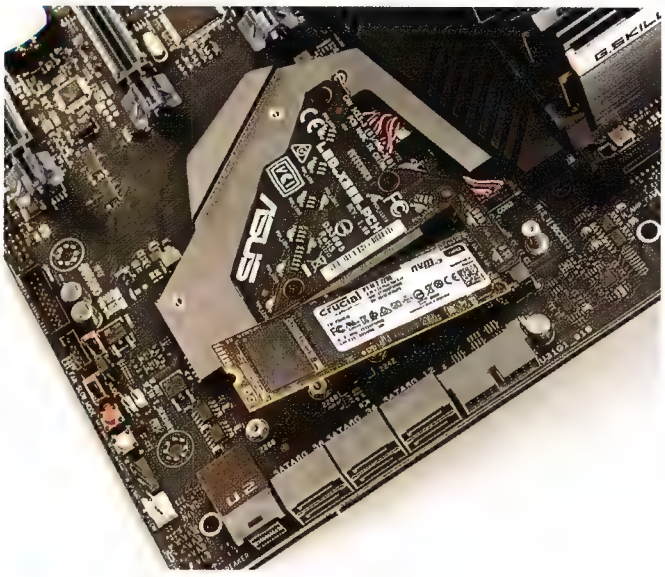


1 THREADRIPPER INSTALLATION

It's easy to forget the hoops you have to jump through to install these Threadripper processors. Take your Torx screwdriver and unlock the three screws located at points 1, 2, and 3 on the socket. Lift up the first bracket (it should pop up, actually), lift the second bracket up with the blue tabs, then slowly slide out the plastic cover. Take your Threadripper processor on its orange sled, and line up the golden corner with the notch on the corner of the socket bracket. Then slowly slide that processor sled down the blue bracket, making sure it locks into place on the latches. Finally, lower the blue bracket back down, followed by the main one, and secure the Torx screws back down in reverse order.

2 COOLER & PASTE

Be Quiet! advises you to install this cooler with the motherboard out of the case. We're not sure that's entirely necessary; it does make installing the fans a little easier, but aside from that, you're solid. The Dark Rock Pro TR4 is incredibly simple to install, and comes with two fans. There are cutouts for memory DIMMs, but it does cover the topmost PCIe slot. That said, do install your memory first. As for thermal paste, we've gone for a light spreading technique. We figured that, given the size of the chip and the location of the four dies, for better consistency in performance, a spread method for Threadripper, as opposed to multiple dots, makes more sense, as it almost guarantees perfect coverage, and minimises mess. We used an old credit card to carefully spread a thin layer across the entirety of the chip.

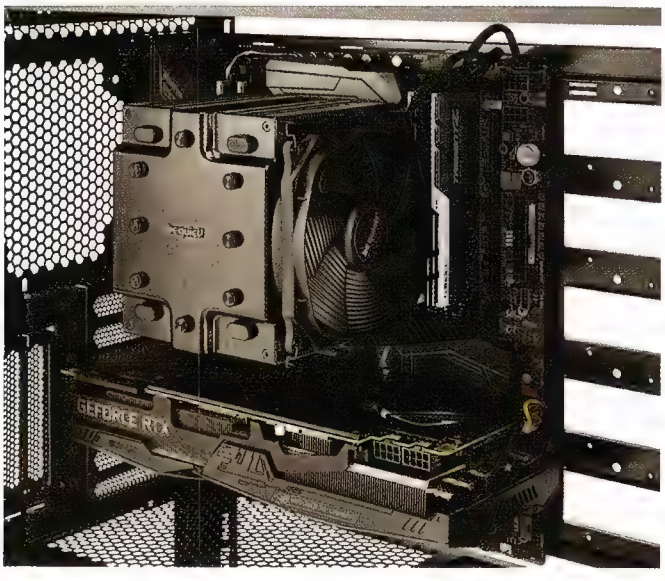


3 MOTHERBOARD OVERSIGHT

By default, the X399 Zenith Extreme supports up to three M.2 SSDs directly on the mobo itself, one here (our 1TB Crucial P1), and another two on the M.2 DIMM slot adapter that Asus is implementing. Annoyingly, over the course of our various testing sessions during the second-gen Threadripper period, we've misplaced our adapter, so are limited to just one on this board (this actually scuppered our plans a bit, because we had wanted to use the P1 as additional storage, and a 512GB 970 Pro as our OS device). To install your M.2 here, you simply need to undo the three small screws on top of the chipset cover, and lift it up. Be careful you don't scratch the reflective finish, though.

4 CHASSIS TIME

So, the motherboard's mostly done, we've installed the SSD, the memory is in, and the cooler's secured in place, with a nice spread of thermal paste. Now it's time to sort out the chassis. The Silent Base 610 has two buttons on the back that you press to release each side panel, but apart from that, there's little else to do. As standard, the chassis comes with two 140mm Silent Wings 2 fans - we've pulled the one attached to the rear as an exhaust, and are instead using it as an additional intake to promote a filtered positive pressure setup. With this out the way, it's time to install the motherboard. Fortunately for us, the Zenith Extreme comes with a rear I/O shield already installed, so there's no messing around and no risk of forgetting it.

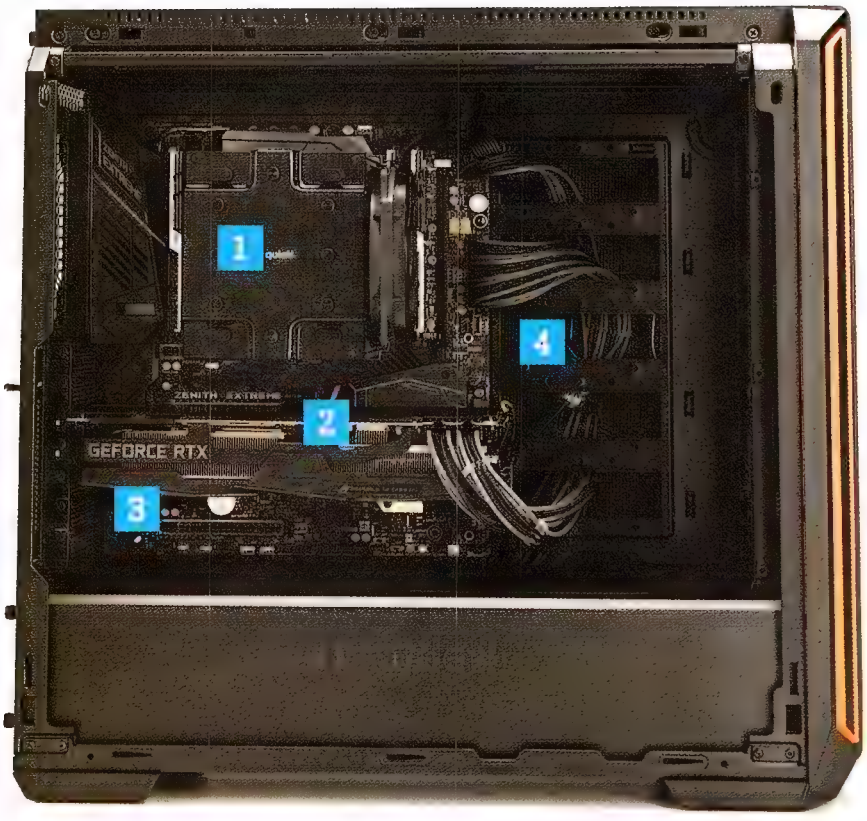


5 RTX MODE ENGAGED

And she's in. Say hello to the Asus RTX 2080. Yes, that triple-slot-sized card sits there with its twin eight-pin PCIe power like the beast it is. It's huge, as powerful as a GTX 1080 Ti, and packed with the latest hardware to take on the future of ray-traced games. Probably. As mentioned earlier, this is where we noticed we had to drop the card down a notch to one of the other PCIe slots. Don't worry, though, because thanks to Threadripper's monstrous 64 PCIe 3.0 lanes, each of the reinforced armor slots can run in x16 mode, no sweat. We are slightly concerned about GPU sag, though.

6 CABLE SIMPLICITY

There's something comfortably reassuring about the fact that all of the X399 platform's cables run along the right-hand side of the board. It means we can bunch all the cables we need together, slap a Velcro strap on them, and they're all tidy and out of the way in the back, with the rest of the chassis looking as clean as a whistle. Make sure the front I/O is plugged in, with the relevant pins, your USB header's in place, then slap the side panels back on, and you've got a clean-looking, quiet streaming and workstation build. What's not to love?



1 The Be Quiet! Dark Rock Pro TR4 features twin 140mm fans, to keep those heat fins dissipating Threadripper's thermal energy.

2 Tucked away down here is a special heatsink Asus will send your way if you're using more than a 16-core Threadripper. It's free on request, and helps keep the VRMs cool when dealing with so many cores.

3 The RTX 2080 Ti ROG Strix has a triple-slot cooler design, and it's a beast. We'd be lying if we said we weren't concerned about GPU sag.

4 These cables add a small but appreciated touch of class.

Red Redemption

There it is, our 16-core Threadripper rig. We set out to build a relatively affordable streaming machine based around AMD's reshuffling of its Threadripper series. The X series is designed with the pro-gamer in mind, the YouTuber, the Twitch streamer. Its immense clout, alongside improved memory latency and multitasking capability, through multiple application use and pure grunty video rendering performance, makes it an ideal jack of all trades.

The build process was a cakewalk. Installing the CPU, RAM, PCIe SSD, and cooler outside the case first made it particularly easy. Be Quiet!'s Dark Rock Pro TR4 is perhaps the easiest mounting solution we've seen from the German manufacturer. And its beefy stature is enough to keep things ticking over quite nicely – if you're willing to do a bit of tweaking....

Once we started testing, we noticed a few issues. Notably with clock speed. Precision Boost Overdrive, AMD's auto-overclocking feature, varies clock speed depending on temperature. Our system seemed to be trying to hit a 68° sweet spot. If apps tried to push the processor above that, PBO would throttle the CPU, and performance would degrade (in this case, with successive Cinebench runs). It's less than ideal, and one reason why we ditched it and started looking into overclocking. Aiming for an 80° maximum (still 20 C lower than TJMax), we started our OC run trying to hit 4.0GHz. Switching the VRMs to a balanced current mode instead of thermal mode lead us into VRM temp issues (even with the Asus VRM heatsink), and the processor throttled itself again. We jumped back into the BIOS, and dropped to 3.9GHz and temperature VRM mode. We left the voltage on Auto, and just played around with the ratio. It's possible you could get 4.0GHz stable, without throttling the VRMs, but 3.9GHz is easily possible.

Gaming performance was ridiculously close to the zero-point. For 4K gaming, CPU upgrades show little benefit. Also, the RTX 2080 performs almost identically to the 1080 Ti. One thing to note: Our ROG Zenith Extreme motherboard did require a BIOS update before we began installing Windows, to make it compatible with the RTX GPUs.

So, we were left with a 16-core, 32-thread 3.9GHz machine, with 64GB of DDR4 clocking in at 3,200MHz, a 1TB Crucial P1 M.2 PCIe SSD, and a nice quiet rig, operating at 70°. Pretty good in our eyes ■

BENCHMARK RESULTS

	APC LABS TEST PC	THIS SYSTEM
CINEBENCH R15 MULTI (INDEX)	2,178	3,396 (56%)
CRYSTALDISK QD32 SEQUENTIAL READ (MB/S)	3,136	1,950 (-38%)
CRYSTALDISK QD32 SEQUENTIAL WRITE (MB/S)	2,126	1,984 (-7%)
RISE OF THE TOMB RAIDER (FPS)	68	66 (-3%)
TOTAL WAR: WARHAMMER II (FPS)	42	42 (0%)
TOM CLANCY'S GHOST RECON WILDLANDS (AVG FPS)	38	38 (0%)
3DMARK: FIRE STRIKE EXTREME (INDEX)	6,988	6,690 (-4%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point consists of an Intel Core i9-7900X, 32GB of G.Skill Ripjaws V @ 3,000, an MSI GeForce GTX 1080 Ti Gaming X, and a 512GB Samsung 960 Pro M.2 PCIe SSD. All tests were performed at 4K at the highest graphical profile.

how to

» QUICK TIPS

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

WINDOWS

QUICKLY RESET FOLDER PERMISSIONS

I've messed up user permissions on a personal folder. What's the easiest way to fix this, please?
Carl Oswald

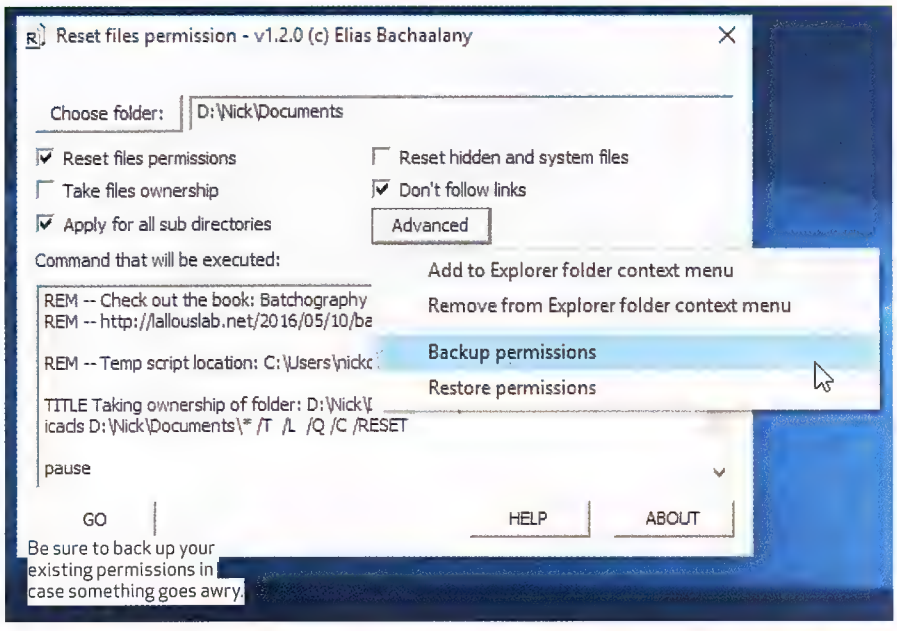
We've found a handy graphical tool that makes the process easy, without you having to delve into the command prompt. Download the tool from **http://lallouslab.net/downloads/ResetPermission.zip**, then follow the step-by-step guide here to use it.

Right-click ResetPermission.zip and choose 'Extract All...'. When prompted, enter the password 'lallouslab'. If your security software blocks the tool, restore it from the quarantine. It's safe to run. Double-click resetpermission.exe to get started.

Click 'Choose folder:' to browse to the folder you wish to perform the reset on. Be sure to avoid root directories and system folders (use the Windows Repair Tool – **www.bleepingcomputer.com** – to fix system permissions issues).

File permissions are a complicated beast, and it's easy to get things wrong. Don't compound your original problem; take a fail-safe backup of the existing permissions by clicking the Advanced button and choosing 'Backup permissions'.

In most cases, the default tick boxes should be left alone, but if you'd like your user account to take ownership of the files – which should increase your access to them – then tick 'Take files ownership'. Click 'Go' when you're ready to proceed.
Cat Ellis


Reset files permission - v1.2.0 (c) Elias Bachaalany
Choose folder:
D:\Nick\Documents
Reset files permissions
Take files ownership
Apply for all sub directories
Reset hidden and system files
Don't follow links
Advanced
Command that will be executed:
REM -- Check out the book: Batchography
REM -- http://lallouslab.net/2016/05/10/ba
REM -- Temp script location: C:\Users\nick
TITLE Taking ownership of folder: D:\Nick\
icads D:\Nick\Documents* /T /L /Q /C /RESET
pause
GO
HELP
ABOUT
Add to Explorer folder context menu
Remove from Explorer folder context menu
Backup permissions
Restore permissions
Be sure to back up your existing permissions in case something goes awry.

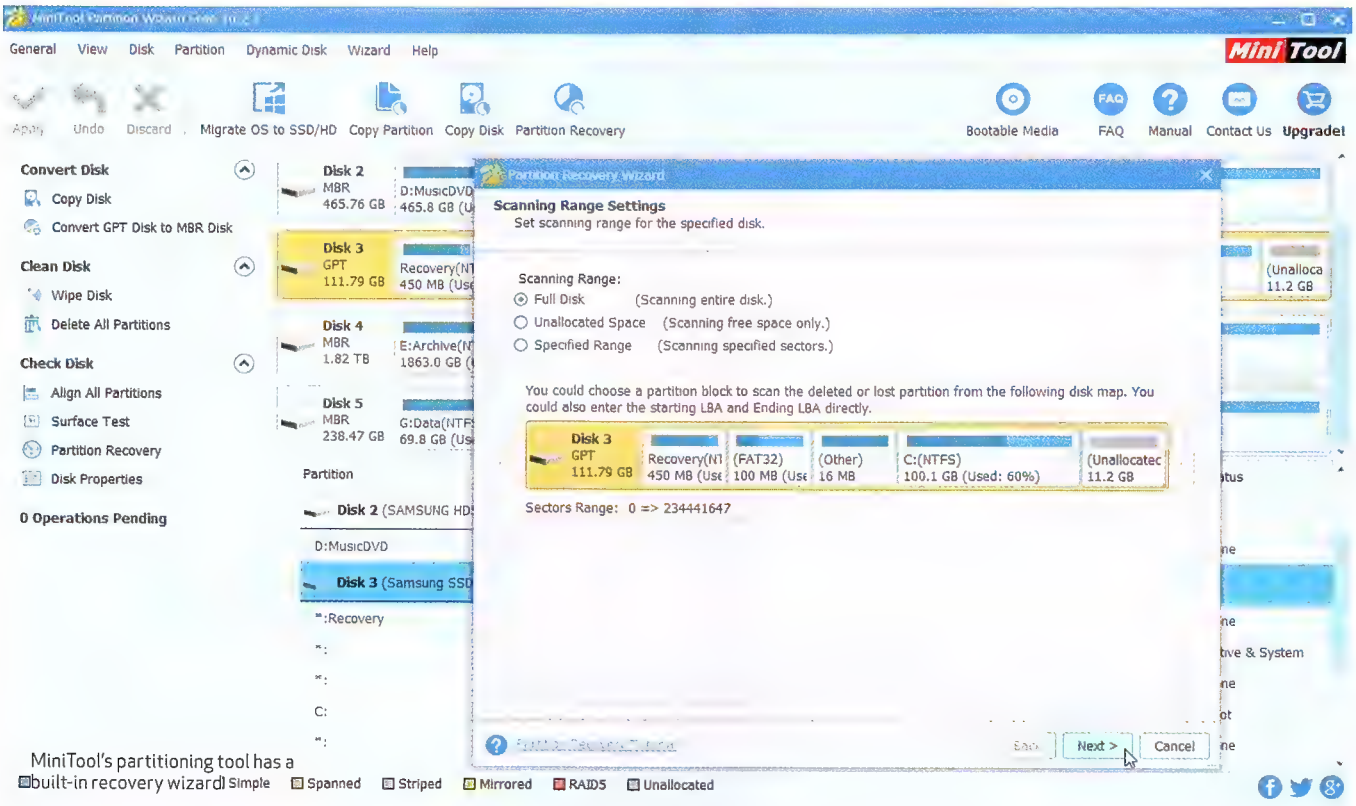
This type of SATA connection is more robust than using a cable.

HARDWARE

DISAPPEARING SOLID-STATE DRIVE

Every now and then – there's no pattern – my second solid-state drive (SSD) will disappear completely. I've pointed my user folders to this drive, so Windows hangs for around five minutes during loading before landing me on a blank desktop. Sometimes a reboot brings the drive back, but other times I have to open it up and remove and reconnect the drive cable. Is this a dying drive?
John Stevens

After some basic checks suggested the drive should be in good health, we asked John to check the connection. He swapped out the cable, but the problem returned again. He then discovered that the cable no longer clipped into place on the drive, suggesting the connector may be the issue. The only solution here to keeping the drive going is to house it in an external enclosure where it's pushed directly into the SATA interface and screwed in place, so the connection can't wiggle loose. John will, of course, have to replace the drive internally with a new drive, but at least the old one will enjoy a new lease of life – once the data's moved across to his new drive, he can use it as a backup or wipe it for some other use.
Nick Peers


General View Disk Partition Dynamic Disk Wizard Help
MiniTool
Migrate OS to SSD/HD Copy Partition Copy Disk Partition Recovery
Bootable Media FAQ Manual Contact Us Upgrade!
Convert Disk
Copy Disk
Convert GPT Disk to MBR Disk
Clean Disk
Wipe Disk
Delete All Partitions
Check Disk
Align All Partitions
Surface Test
Partition Recovery
Disk Properties
0 Operations Pending
Partition Recovery Wizard
Scanning Range Settings
Set scanning range for the specified disk.
Scanning Range:
Full Disk (Scanning entire disk.)
Unallocated Space (Scanning free space only.)
Specified Range (Scanning specified sectors.)
You could choose a partition block to scan the deleted or lost partition from the following disk map. You could also enter the starting LBA and Ending LBA directly.
Disk 3 GPT 111.79 GB
Recovery(NT 450 MB
(FAT32) 100 MB
(Other) 16 MB
C:(NTFS) 100.1 GB (Used: 60%)
(Unallocatec 11.2 GB
Sectors Range: 0 => 234441647
Next >
Cancel
Simple Spanned Striped Mirrored RAID5 Unallocated
MiniTool's partitioning tool has a built-in recovery wizard

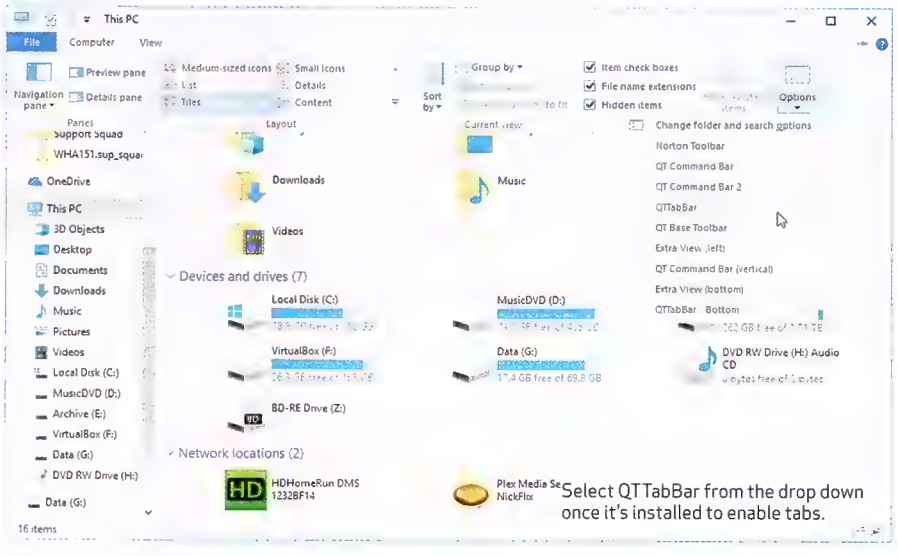
DATA LOST PARTITION

I recently 'lost' half my hard drive. It's 1TB in size, but only shows as 500GB – it was partitioned into two drives (C and F), but only the C drive is currently showing up. I've tried various recoveries I found online with no results – do you have any pointers?
Fredrick Bate

Hopefully this is just a case of a garbled partition table – the F drive is still there, with your data safe and sound, just out of reach. There are several partition recovery tools on the market, but you'll find partition recovery tools built into many free partition managers, such as MiniTool Partition Wizard Free (**www.partitionwizard.com/free-partition-manager.html**). Launch the program and run the Partition Recovery wizard – select your disk and let it scan to see if it can find and restore the partition. If this fails, use the free version of DMDE (**https://dmde.com/**) to see if the partition can be seen, allowing you to copy data from the drive – we recommend running a full disk check before attempting to do anything else with the drive, such as creating a new partition in the empty space to copy your recovered data back to.
Rob Mead-Green

WINDOWS ADD TABS TO FILE EXPLORER

I frequently work with three or four folder windows open – is there some way to collect these in a single tabbed window, like you can with tabs in Google Chrome?
Jack Merry



Select QTTabBar from the drop down once it's installed to enable tabs.

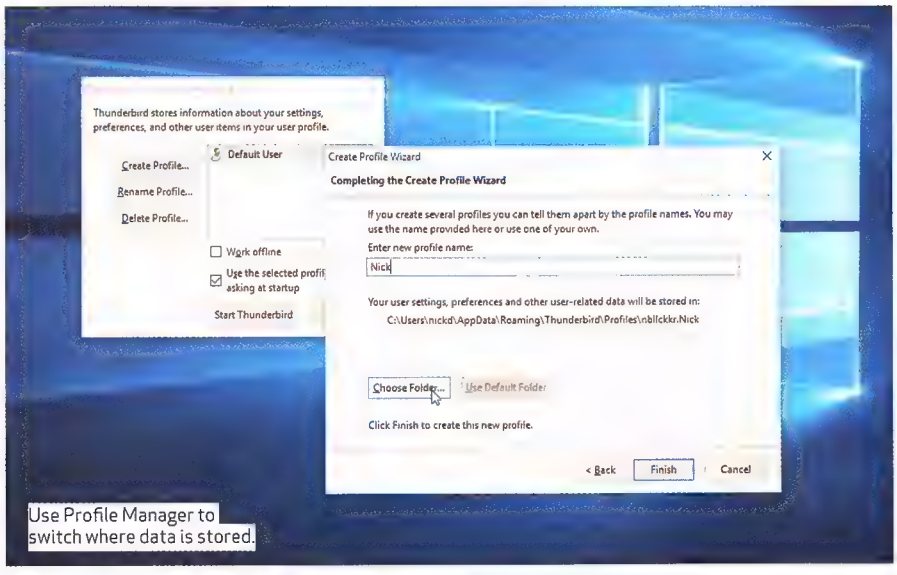
There are several tabbed explorer programs out there – the best ones integrate with File Explorer rather than replace it. One such hidden gem is QTTabBar. from QuizoApps. Read the step-by-step guide here to find out how to use it.

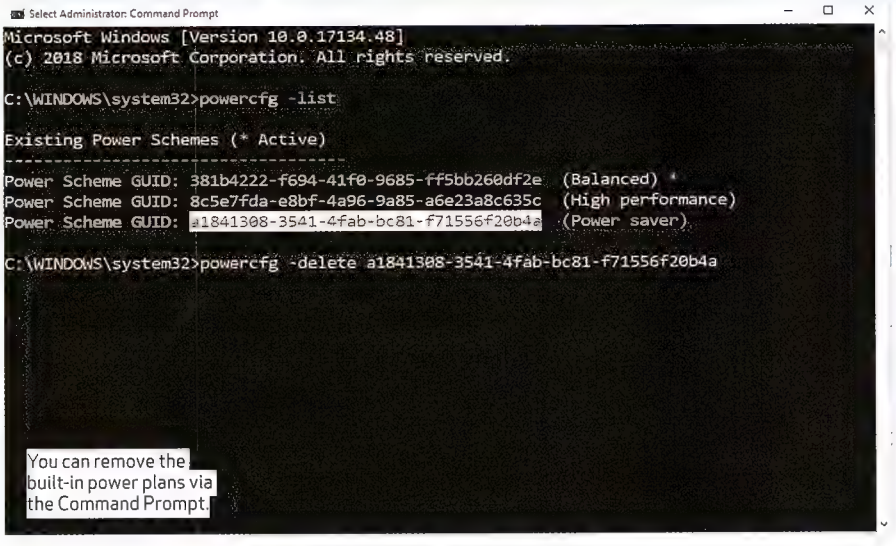
Head to **https://qttabbar.wikidot.com** and download 'QTTabBar ver 1038'. Extract the contents of the ZIP file, then double-click QTTabBar.exe to install it. Next, follow the prompts, log out or restart the Windows Explorer process in Task Manager.

By default, the new tab bar is disabled – Windows 7 users should select View > Toolbars > QTTabBar to enable it; Windows 8.1 and 10 users need to activate it via the Options drop-down menu on the View tab of the Ribbon.

Once enabled, tabs appear beneath File Explorer's Address bar in Windows 8.1 and 10 – these work in the same way they do in your web browser. Click '+' to select a new folder, then drag and drop items between tabs to move or copy them.

Roll your mouse over a folder or ZIP file and you will see a downward arrow – click this to browse the folder or file's contents via a drop-down menu. Other extras in QTTabBar include being able to set up split-screen windows and group related tabs together.
Cat Ellis


Thunderbird stores information about your settings, preferences, and other user items in your user profile.
Create Profile...
Rename Profile...
Delete Profile...
Default User
Work offline
Use the selected profile asking at startup
Start Thunderbird
Create Profile Wizard
Completing the Create Profile Wizard
If you create several profiles you can tell them apart by the profile names. You may use the name provided here or use one of your own.
Enter new profile name:
Nick
Your user settings, preferences and other user-related data will be stored in:
C:\Users\nickd\AppData\Roaming\Thunderbird\Profiles\nbllckkr.Nick
Choose Folder...
Use Default Folder
Click Finish to create this new profile.
< Back
Finish
Cancel
Use Profile Manager to switch where data is stored.


Select Administrator: Command Prompt
Microsoft Windows [Version 10.0.17134.48]
(c) 2018 Microsoft Corporation. All rights reserved.
C:\WINDOWS\system32>powercfg -list
Existing Power Schemes (* Active)
Power Scheme GUID: 381b4222-f694-41f0-9685-ff5bb260df2e (Balanced) *
Power Scheme GUID: 8c5e7fda-e8bf-4a96-9a85-a6e23a8c635c (High performance)
Power Scheme GUID: a1841308-3541-4fab-bc81-f71556f20b4a (Power saver)
C:\WINDOWS\system32>powercfg -delete a1841308-3541-4fab-bc81-f71556f20b4a
You can remove the built-in power plans via the Command Prompt.

EMAIL

HELP WITH MOVING THUNDERBIRD PROFILE

I back up my PC using Acronis TrueImage, but find I lose several days of emails each time I have to restore a recent backup. I've set up a second drive partition for my data – can you help me transfer my Thunderbird emails to this partition, so they're not lost when Windows has to be rolled back?

Colin Travis

This is a relatively straightforward – if convoluted – process that involves moving your entire Thunderbird profile folder to a new drive, then pointing Thunderbird to it – the upside is all changes to your profile aren't lost when you restore Windows, but remember to back up the profile folder separately.

First, locate your Thunderbird profile: press Win-R, type %appdata%\Thunderbird\Profiles and press [Enter] to locate it – you should see a folder with '.default' at its end, which is your profile folder. Create a Thunderbird folder on your data drive, and then copy this '.default' folder to it. Now press Win-R again, but this time type thunderbird -profilemanager and press [Enter.] Now click 'Create Profile...', enter a suitable name and click 'Choose Folder...' to select the profile folder on your data drive. Click 'OK', verify that it's the correct path and click Finish, then select Start.

If folders – and possibly even the inbox – are invisible, select Tools > Account Settings > Server Settings and then click Browse to update the location.

NICK PEERS

WINDOWS

PROBLEM WITH PC POWER SETTINGS

I can never get my desired power setting on my PC – setting the display to never turn off. Every time I restart or shutdown, Windows reverts to the default 15 minutes. I've tried fixing system files and various settings in the Registry, and also created new profiles, none of which have held. A reinstall failed, too. Do you have any suggestions that might help?

Arvin Gilman

Some people have reported this issue with selected third-party apps – HD Tune (**www.hdtune.com/**) is one such culprit, and Arvin wondered if IOLO System Mechanic (**www.iolo.com/products/system-mechanic/**) might be the culprit here – he'd removed it prior to upgrading from Windows 7 to Windows 10). Some security programs are also known to block changes to power settings. In Arvin's case, however, he was able to fix his problem by deleting the three default power plans. To do this, first create a custom plan under Power Options and then make sure it's set as the active plan. Next, right-click the Start button and choose Command Prompt (Admin). When it's opened, type the following command: powercfg /list

This lists all plans – your custom plan should marked with an asterisk to indicate it's active. To delete the others, highlight the long alpha-numeric GUID next to the Balanced plan and press Ctrl-C, then type powercfg -delete and press Ctrl-V to paste in the plan's GUID. Press Enter and then repeat for the other two default power plans in Windows 10 – 'High performance' and 'Power saver').

Rob Mead-Green

WINDOWS

DESKTOP.INI FILE KEEPS OPENING AT STARTUP

After installing the Windows 10 April 2018 Update a 'desktop.ini' file keeps opening in Notepad when my PC starts. I've traced the file to the Startup folder – I had to tick 'Hidden items' on the View tab in File Explorer to see it – but any attempts to delete the file have resulted in an 'access denied' error. Can you help?

Don Baxter

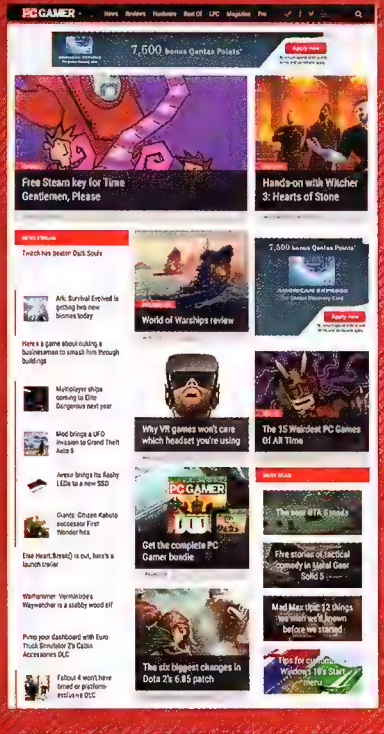
Don had attempted to access the file's permissions by right-clicking the 'desktop.ini file', then choosing the Properties > Security tab, but no permissions for the file were shown. Luckily, Don was able to resolve his problem by using a file unlocker tool to delete the offending file.

If the same thing is happening on your PC following the April 2018 Update, then download and install IObit Unlocker from **www.iobit.com/en/iobit-unlocker.php** – launch the app and then drag the offending 'desktop.ini' file from its File Explorer window into the program and click the drop-down arrow next to the Unlock button, then select 'Unlock & Delete' to remove it; if necessary, tick the 'Forced Mode' box first.

Once done, reboot your PC and while the file will still be recreated, it won't open at startup anymore.

Mayank Sharma

SMARTER COOKIES ENABLED


PC GAMER
7,500 bonus Qantas Points
Free Steam key for Time Gentlemen, Please
Hands-on with Witcher 3: Hearts of Stone
World of Warships review
Why VR games won't care which headset you're using
The 15 Weirdest PC Games Of All Time
Get the complete PC Gamer bundle
The six biggest changes in Dota 2's 6.85 patch

JOIN US ONLINE AT
WWW.PCGAMER.COM

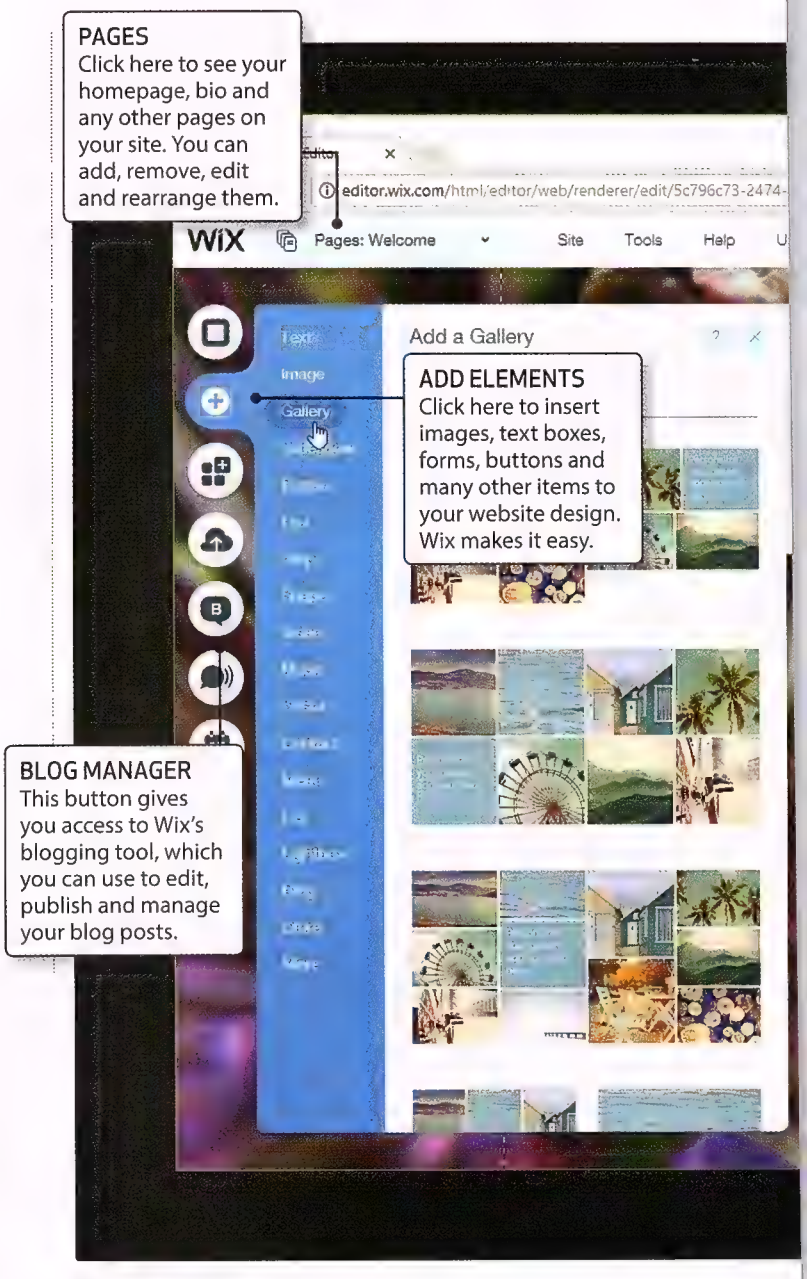
Create your own website

Give your hobbies and interests a proper home online with the brilliant – and free – Wix.

Cat Ellis

Social media is a great way to share your interests with close friends, but if you're serious about a particular topic – whether it's photography, cooking, writing, travel or any other pastime – having your own website will make it easier to share them with the world. Creating your own site means you have total control over what's published and how it looks. Want to start a blog? You can do that. Want to show off high-quality photos in a gallery? No problem. Want to start an online shop? There's nothing stopping you.

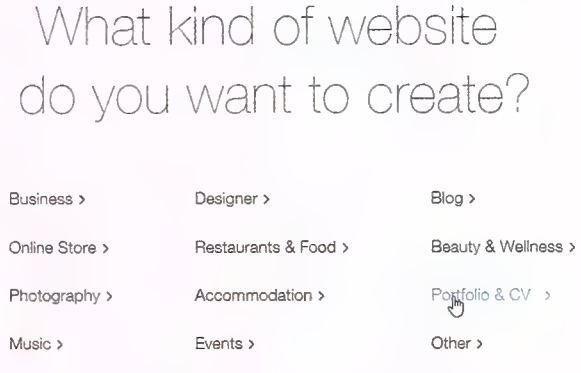
We've tried all the most popular site-building tools, and in our opinion Wix is easily the best. It has a huge set of stunning templates, a simple drag-and-drop interface for moving items around, and an 'ADI' (Artificial Design Intelligence) tool that makes the process effortless. Best of all, it's free. Let's get started.


PAGES
Click here to see your homepage, bio and any other pages on your site. You can add, remove, edit and rearrange them.
editor.wix.com/html/editor/web/renderer/edit/5c796c73-2474-
WiX
Pages: Welcome
Site
Tools
Help
Add a Gallery
ADD ELEMENTS
Click here to insert images, text boxes, forms, buttons and many other items to your website design. Wix makes it easy.
Text
Image
Gallery
BLOG MANAGER
This button gives you access to Wix's blogging tool, which you can use to edit, publish and manage your blog posts.

Design and publish a website

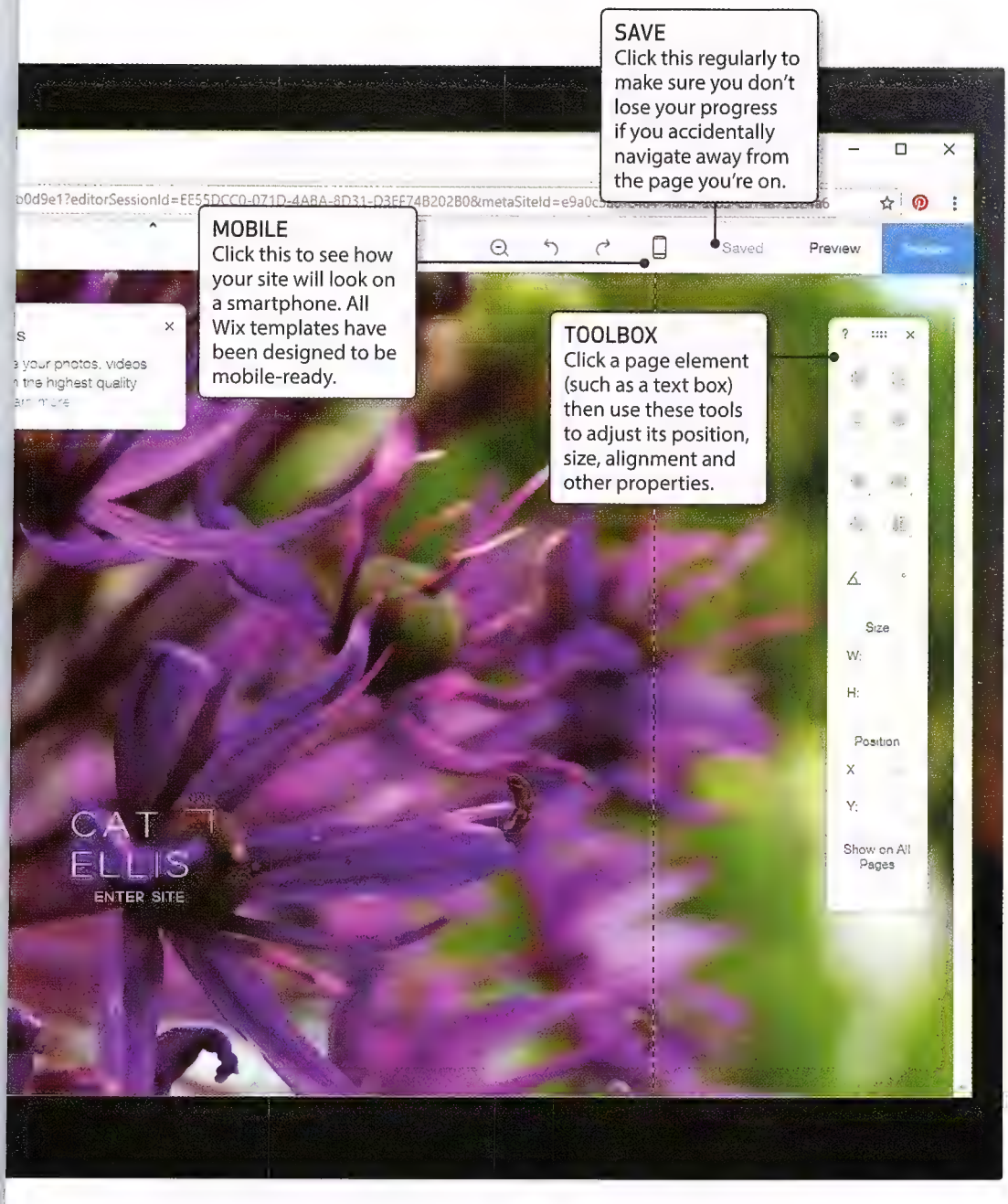
1 GET A PHOTO EDITOR

Before you get started, it's worth downloading a free photo editor so you can make simple adjustments to any pictures you want to add to your site (like cropping, rotating and adjusting colours). Adobe Photoshop Express is free from the Microsoft Store (**http://bit.ly/2xWE8Mu**) and is easy to use, but if you do get stuck you can find a quick tutorial here: **http://bit.ly/2knXDdG**.



2 GET A WIX ACCOUNT

Visit **www.wix.com** and click 'Start now'. You can log in using your Facebook or Google account, or create one specifically for Wix using your email address. To make a new account, click 'Sign up', enter your email address and create a password. Once you're logged in, select the type of website you want to make. If you can't see an option that sounds right, select Other.

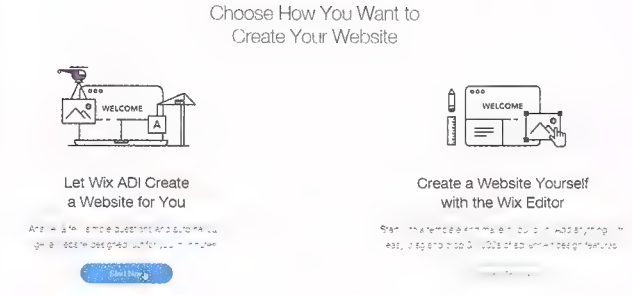

SAVE
Click this regularly to make sure you don't lose your progress if you accidentally navigate away from the page you're on.
MOBILE
Click this to see how your site will look on a smartphone. All Wix templates have been designed to be mobile-ready.
TOOLBOX
Click a page element (such as a text box) then use these tools to adjust its position, size, alignment and other properties.
Saved
Preview
Size
W:
H:
Position
X
Y:
Show on All Pages
CAT
ELLIS
ENTER SITE

Jargon buster!

ADI
Artificial Design Intelligence – Wix's question-based tool, which creates a unique website design based on your answers.

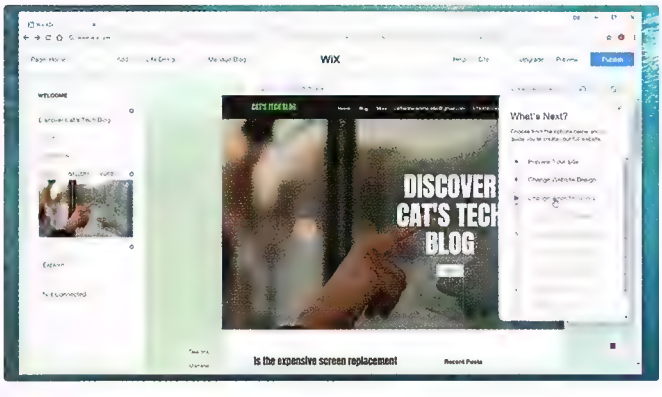
BLOG MANAGER
The tool you use to create, update and organise your blog using Wix. You can find full instructions on how to use it at **http://bit.ly/2gftIAf**.

URL
Uniform Resource Locator – an address to a location on the web, such as a site, page or an image.


Choose How You Want to Create Your Website
WELCOME
Let Wix ADI Create a Website for You
WELCOME
Create a Website Yourself with the Wix Editor

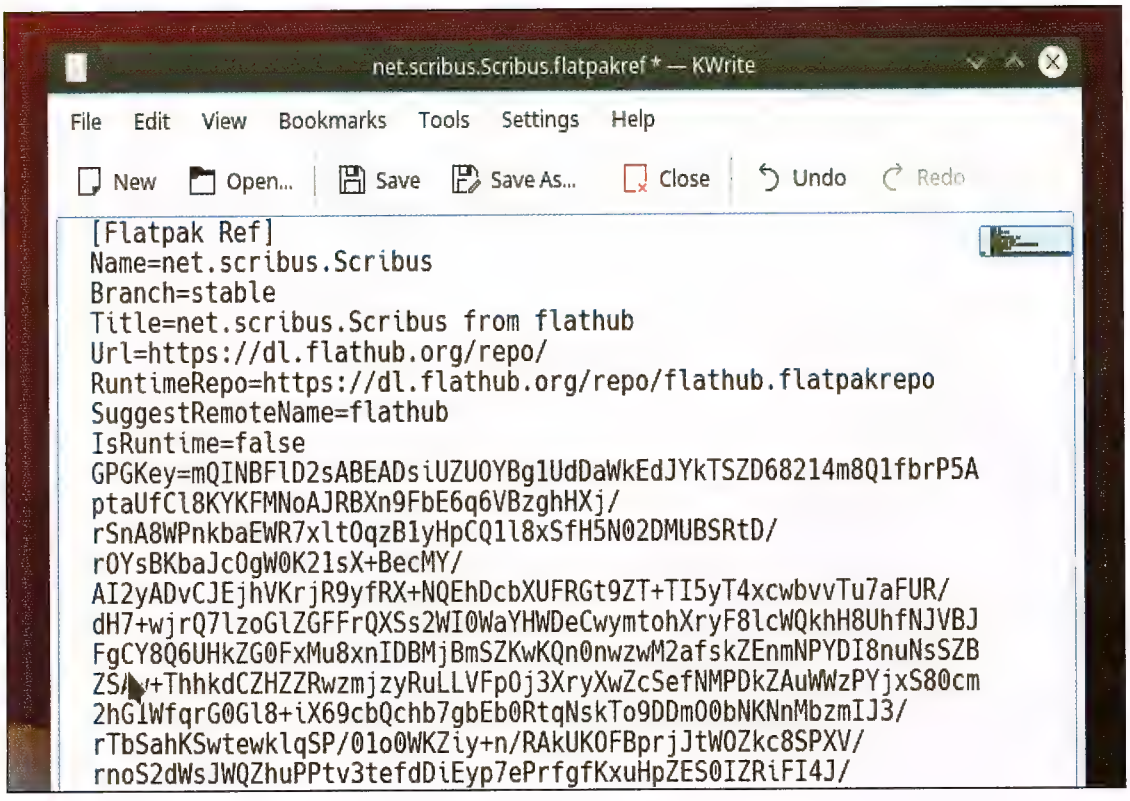
3 GET STARTED WITH ADI

You'll now be asked whether you want to create your website using the Wix ADI tool or design it yourself. If you want to make a site as quickly as possible, select the first option, then answer the questions you're asked as thoroughly as you can. Don't worry if some of the information (such as an address) isn't relevant – you can skip any parts you need to.



4 MAKE YOUR HOMEPAGE

The Wix ADI will prompt you to choose a colour scheme, then prepare the initial design for your homepage based on the information you've provided. Once it's finished, the ADI will present you with a list of steps to follow. Run through them, skipping any you don't need. Once you reach the end, you'll have a finished custom website. It really is that easy!



A flatpakref file contains all the information necessary to find an application, determine its dependencies, and install everything.

Get hold of up-to-date software with Flatpaks

Aaron Peters went all in on Ubuntu's .deb package format years ago, and has never looked back. That said, there's always time for a second opinion...

Linux has made great strides in the area of software compatibility. Or, more accurately, software is available more consistently across the various distributions and their native package formats. Yet this still requires the hard work of packagers. They need to take an application and tweak it to fit the specific needs of different distros, and even different releases of the same one. However, a few new universal package formats have emerged, bringing the promise of "package once, run anywhere" (on Linux, anyway).

Flatpak (**https://flatpak.org**) is among the contenders and it's got a lot going for it. In this article we'll examine Flatpak, explore how to use it, and take a look at two important developments.

MODE OF OPERATION

Flatpak is both a package format, and a tool to install and manage those packages. Many Linux package formats work on the concept of dependencies, which means a developer can define that package A depends on package B. When a user tries to install my package A, the system will recognise the dependency and install package B along with it. This is how you `apt install` one application, and end up with a hundred packages to be downloaded and installed.

In contrast, Flatpak provides you both the application and everything it needs to run in a distro-independent format. This approach has its pros and cons:

PROS	CONS
DISTRIBUTION AGNOSTIC	USES EXTRA SPACE WITH DUPLICATE FILES
EASE OF INSTALLATION	INSTALLATION BY EITHER ROOT OR NON-ROOT USERS
NO CONFLICTS WITH LOCAL SYSTEM	UNABLE TO INSTALL SERVER APPLICATIONS

Yet the basic idea behind Flatpak is attractive. Find a program, install it easily, and run it without worrying about what else on your system may be using an incompatible version of the same library. Furthermore, installing applications as Flatpaks enables you to mix and match programs in ways you can't with your normal package system, such as:

- Using the bleeding-edge version of an application, while keeping the standard version as well. Example: LibreOffice, shown in the screenshot running versions 5 and 6 at the same time.
- You have security concerns, and feel better with the program operating in a sandbox. Example: Adobe's Flash Player.
- To use a more recent, more stable, and/or more full-featured version of an application than your distribution provides. Example: Calibre, which is well behind even on Ubuntu 16.04.

Yet there are other formats that provide similar advantages. These include Ubuntu's Snap format (**www.snapcraft.io**) and AppImage (**https://appivmage.org**). While they all perform similar functions, Flatpak has a leg up on the competition in a couple of ways:

- Snapcraft is a Canonical project, and while it's available in other distributions, it's a first-class citizen of Ubuntu. If you use another distro, or just prefer a software system that's not controlled by a single, commercial entity, Flatpak is a better choice

than Snap.

- AppImage takes the approach of simply downloading and running a single file. This is straightforward, but not necessarily easy, especially for new users. First off, you need to set the downloaded AppImage file to be executable before you can run the app. In addition, there isn't a built-in mechanism to update your AppImages. The project offers an external tool to do so, but you need to download and configure that yourself as well.

Despite all this talk of pros and cons, you can use any (or all!) of the above formats on your machine at the same time. That defies logic, doesn't it? How did the developers accomplish this? Let's examine the Flatpak format a little more closely to find out.

UNPACKING FLATPAK

Like most open source projects, Flatpak stands on the shoulders of giants to accomplish its goals. Two key technologies behind Flatpak are ostree and bubblewrap.

When you install a Flatpak, you're installing an ostree "bundle" containing the application. The project's website describes it as something like "git for operating system binaries." In addition to other benefits, this approach provides for atomic updates, which is a fancy way of saying that only what needs to get updated, gets updated. It also provides a rollback mechanism.

Suppose you have a program with file 1 and file 2. An update provides a new version of file 2, which is actually designated file 3. The program will operate quite happily using file 1 and file 3 until you want to roll back a version. But you won't need to do a whole uninstall/reinstall operation. You just need to change the application so it uses file 2 instead of the newer file 3 (which still exists, in case you want to "roll-forward").

The other helper technology is bubblewrap, a software layer that in turn uses the Linux kernel's user namespaces feature. It enables non-root user accounts to serve as root accounts in containers, including a Flatpak sandbox. When you run a Flatpak application it'll start as sub-system consisting of the Flatpak application and a select number of system resources for the sandbox to use. The FlatPak wiki on GitHub (**https://github.com/flatpak/flatpak/wiki/Sandbox**) has a page that describes the contents of the sandbox in detail, but some key attributes are:

- The application's runtime(s) are mounted in the sandbox within **/usr** (the structure of which is explained in more detail in the box (right).
- The application itself is mounted within **/app**.
- Configurations from the host **/etc** directory are mounted to the sandbox's **/usr/etc**.
- Only processes in the sandbox are visible from the sandbox, for example the **/proc** directory.
- Assets such as icons, fonts and so on are available through "bind-mounts," or mounting one file/directory (outside the sandbox) to a different spot in the filesystem (within the sandbox).
- Overall, the sandbox has access only to the resources it needs to function, and then only with the least possible privileges.

Now, if you're not too confused yet, we'll add another level of complexity. Because while most software requires root privileges to install on a Linux system, normal users can install Flatpaks. In the next section we'll examine the difference between these "user installs" and a more traditional "system install."

SYSTEM VERSUS USER

Seasoned Linux users are accustomed to providing a root password when installing software. That software ends up in a directory outside your **$HOME**, such as **/usr/bin**, **/opt** or perhaps even **/usr/local**. But as mentioned in our pros list, Flatpak supports the ability to install a program for a specific user, as opposed to the entire system. This works because a normal user has access to the necessary resources to run a program, and the sandboxes created by the user receive this same access.

When you run any of the install commands we'll see in a few moments, you'll be prompted for your password. This is because Flatpak will carry out system installs by default. What this means is that a program will be available to all users and that its files will be stored in **/var/lib/flatpak**.

Alternately, if you use the `--user` flag with a command – it'll just install for your account (you shouldn't be prompted for a password). The files in this case will be in **$HOME/.local/share/flatpak**. This is useful if you don't have an administrator account on your machine, or perhaps if you want to try a bleeding-edge version of a program

Anatomy of a Flatpak

Installing a Flatpak will create a file structure for the program and its runtimes, as well as some metadata. The basic structure of this consists of four top-level directories in either $HOME/.local/share/flatpak or /var/lib/flatpak, depending on whether it was a system or user install.

The first of these is repo, which contains information about installed applications, remotes, and other metadata. The app directory is where the applications themselves live. Each program has a sub-directory named with its three-part identifier (for example, org.gnome.GEdit). There are further sub-directories that are set aside for architecture (such as x86_64), version numbers, and their associated checksums.

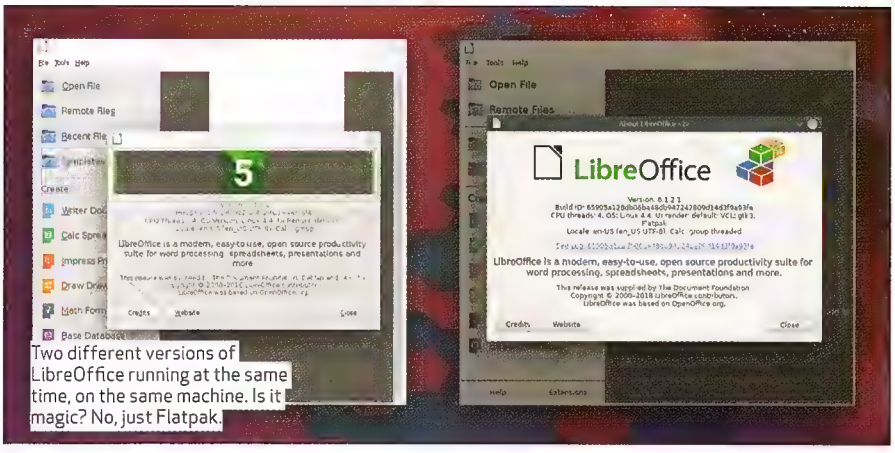
Runtimes are managed in the same way, but are kept separately in the runtime directory. This is because they can be shared across more than one application. The final directory is exports, containing items related to the Flatpak programs yet sits outside the sandbox. These include things like the application icon and .desktop file (which will appear in your desktop's application menu), and system references such as connections to the windowing system. The exports directory contains links to things inside the Flatpak, and is one of the carefully controlled touchpoints between the host system and Flatpak's sandbox.

The following shows the export of the tree command run following a LibreOffice Flatpak installation:

```
$ aaron@acp-demon:/var/lib/flatpak$ tree -L 2
app
    org.libreoffice.LibreOffice
    appstream
        flathub
    exports
        bin
        share
    repo
        config
        extensions
        flathub.trustedkeys.gpg
        objects
        refs
        state
        tmp
    runtime
        org.freedesktop.Platform
        org.freedesktop.Platform.ffmpeg
        org.freedesktop.Platform.Locale
        org.libreoffice.LibreOffice.Locale
```

that's installed elsewhere on the system.

The user install is possible because of how the sandbox is constructed. Think of it this way: as a user, you have the ability to run an application. That application has the rights (through your user account) to create an on-screen window, write files to disk, and access network connections. When you install a Flatpak as a user, any resources from the host system are limited by what you yourself could access with a normal" program.


Open File
Remote Files
LibreOffice
LibreOffice is a modern, easy-to-use, open source productivity suite for word processing, spreadsheets, presentations and more.
Two different versions of LibreOffice running at the same time, on the same machine. Is it magic? No, just Flatpak.

INSTALLING FLATPAK

The first component you need to install Flatpaks (the package format) is Flatpak (the application). Most distros provide it in their repositories. In Ubuntu, you can issue the following to get up and running:

```
$ sudo apt install flatpak
```

This will, of course, give you the version that's packaged with the current version of your distro. If you're on a long-term support version, such as Ubuntu's 16.04 (Xenial), this may mean you won't get newer features. Installing from the official Flatpak PPA is the recommended way to make sure you always have the most recent version:

```
$ sudo add-apt-repository
ppa:alexlarsson/flatpak
$ sudo apt update
$ sudo apt install flatpak
```

Once it's installed, you'll be able to install Flatpak programs using the command line. But some GUI package managers also have support for the format. KDE's Discover, for example, can manage your Flatpak files if you install the appropriate backend.

With the right tools installed, there's one quick step to take before you can start hunting for some new apps.

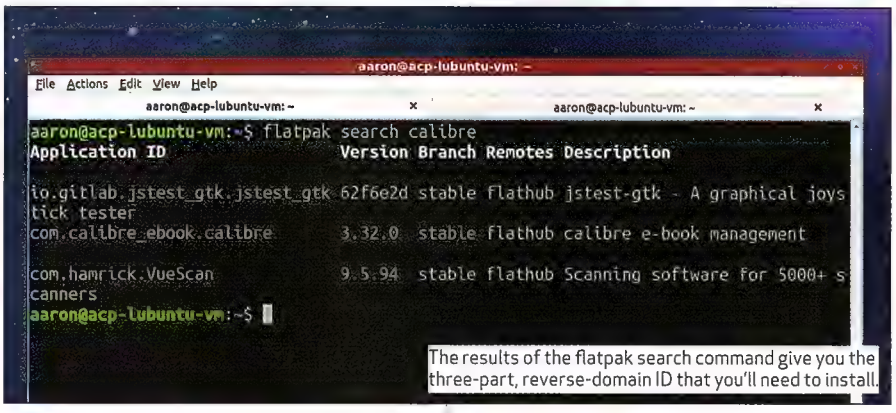
FLATPAK HUBS

Flatpak seems to have adopted the term hubs to describe collections of software, just like RPM or DEB repositories. The Flatpak site itself hosts the first one you should add, FlatHub. Register it with your system using your package manager, or at the terminal with the following command:

```
$ flatpak remote-add --if-not-
exists FlatHub https://
flathub.org/repo/flathub.
flatpakrepo
```

You can see a list of your configured hubs by running

```
$ flatpak remotes
```


aaron@acp-lubuntu-vm: ~
File Actions Edit View Help
aaron@acp-lubuntu-vm: ~
aaron@acp-lubuntu-vm: ~
aaron@acp-lubuntu-vm:~$ flatpak search calibre
Application ID Version Branch Remotes Description
io.gitlab.jstest_gtk.jstest_gtk 62f6e2d stable flathub jstest-gtk - A graphical joystick tester
com.calibre_ebook.calibre 3.32.0 stable flathub calibre e-book management
com.hamrick.VueScan 9.5.94 stable flathub Scanning software for 5000+ scanners
aaron@acp-lubuntu-vm:~$
The results of the flatpak search command give you the three-part, reverse-domain ID that you'll need to install.

ON THE MENU

There are a couple of different application types that lend themselves to being packaged as Flatpaks. The first of these is commercial applications. If the developers of commercial products don't make it easy for the community to pick their applications apart, it's solely up to them to package everything.

Flatpak gives a single target for packages that will work across distros, and sandboxing the apps can help reduce support costs. Some examples of commercial (though free) programs in Flathub include Steam, Slack, and Sublime Text.

Another type of application that makes a good Flatpak is large, complex applications. These benefit from Flatpak's atomic upgrades, making the update process a little less painful, and the roll-back process even less so. LibreOffice, which is normally a 200MB update, and Android Studio, which is even more, are both available as somewhat more convenient Flatpaks.

Finally, cross-platform apps already have two completely different OS targets (at least for desktop, even more if they're mobile). Developers and packagers surely don't need to worry about the idiosyncrasies of a dozen Linux distros on top of that. Just wrap your app up as a Flatpak, and you're good to go.

INSTALLING FLATPAK PROGRAMS

Installing applications from the Flatpak will feel very familiar if you're accustomed to using apt or either yum or dnf on your system. The search command will show you hits in any of

Rounding out flatpaks

This article comes at a time when Flatpak recently enjoyed two significant developments. The first is the project's v1.0 release, which came out on 20 August, 2018. As befits such a milestone, the press release (**https://flatpak.org/press/2018-08-20-flatpak-1.0**) called the new version "feature-complete," with all the necessary resources for both developers and users. So in addition to the Flatpak commands we've mention in this article and support by most major GUI package managers, there are also tools to help developers package their applications as Flatpaks. If you're a coder-type, check the "Build applications" section of Flatpak's help (flatpak --help) for an idea of some of the utilities at your disposal.

But the launch of another initiative is arguably more interesting. The WinePak project (www.winepak.org) project utilises Flatpaks to help ease the installation of Windows programs. It does this by providing the application and an optimised Wine installation in a format that's simple to install. It promises to do away with all the configuration-fiddling that typically comes along with Wine-based installs. While the selection at the moment is quite small, there are some top-tier games already in there, including *Overwatch*, *World of Warcraft* and *League of Legends*.

your configured for the keyword that you provide:

```
$ flatpak search calibre
```

This will return a result for the excellent Calibre e-book manager, which is often out of date in the Ubuntu repositories. Note the first column, which gives the Application ID in a sort of reverse-domain format (com first, then domain, and so on.). You'll need to give this to the install command for Flatpak to install your program:

```
$ flatpak install com.
calibre_ebook.calibre
```

At this point Flatpak will start downloading and installing your application and any runtimes (org.freedesktop – see the screenshot, below right) it requires. A runtime is a collection of libraries and other software for the application. It's the Flatpak way of resolving your dependencies for you.

"Wait," you might say, "isn't this what apt and yum do for me?" It's a fair question. There are a few notable factors that set runtimes apart from normal Linux dependency management.

- Flatpak's sandbox environment ensures anything you install won't conflict with your system proper.
- A runtime is a fixed set of software, so you know you'll get exactly you need to run the app – no more, no less.
- Flatpaks are built against specific runtimes, so there's no need to worry about upgrades breaking your program all of a sudden.

The trade-off boils down to confidence that the program will always have what it needs to run as intended, but note that it'll need to take up more disk space to do so.

There are a couple of other methods you can use to install applications. If you happen across a rogue Flatpak and download it, install it from the command line using the command above:

```
$ flatpak install somefile.
flatpak
```

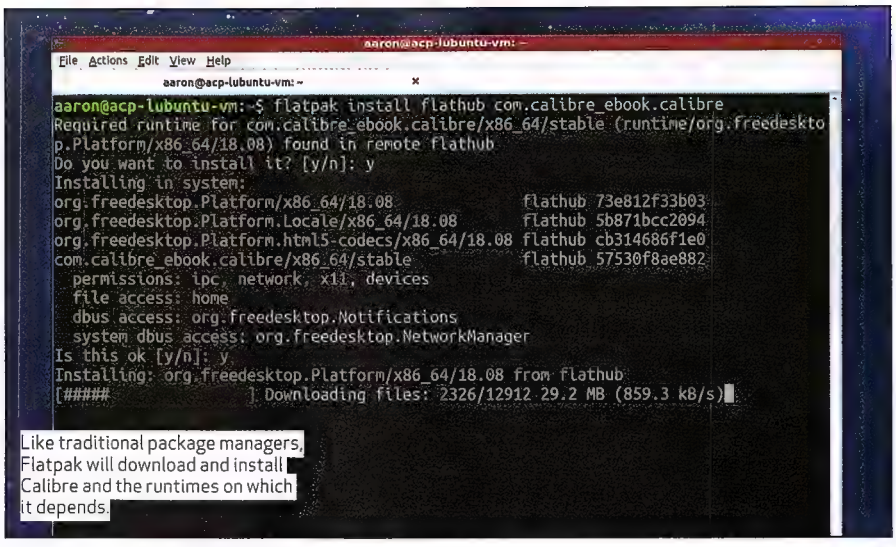
Finally, Flatpak provides a method for installing an application by running an installation file. This file, called a **flatpakref**, contains some metadata about the program, including:

- Its full name.
- The hub from which it should be downloaded.
- Its version
- Whether it is a runtime or not.
- Its GPG signature.

Installing from a **flatpakref** file is the same as installing from a locally downloaded Flatpak file:

```
$ flatpak install ./
somereffile.flatpakref
```

You can also use a GUI package manager, which should display and install Flatpaks in the same way it does other packages (provided that you installed the backend).


aaron@acp-lubuntu-vm: ~
File Actions Edit View Help
aaron@acp-lubuntu-vm: ~
aaron@acp-lubuntu-vm:~$ flatpak install flathub com.calibre_ebook.calibre
Required runtime for com.calibre_ebook.calibre/x86_64/stable (runtime/org.freedesktop.Platform/x86_64/18.08) found in remote flathub
Do you want to install it? [y/n]: y
Installing in system:
org.freedesktop.Platform/x86_64/18.08 flathub 73e812f33b03
org.freedesktop.Platform.Locale/x86_64/18.08 flathub 5b871bcc2094
org.freedesktop.Platform.html5-codecs/x86_64/18.08 flathub cb314686f1e0
com.calibre_ebook.calibre/x86_64/stable flathub 57530f8ae882
permissions: ipc, network, x11, devices
file access: home
dbus access: org.freedesktop.Notifications
system dbus access: org.freedesktop.NetworkManager
Is this ok [y/n]: y
Installing: org.freedesktop.Platform/x86_64/18.08 from flathub
[#####] Downloading files: 2326/12912 29.2 MB (859.3 kB/s)
Like traditional package managers, Flatpak will download and install Calibre and the runtimes on which it depends.

RUNNING FLATPAK PROGRAMS

Once your program is installed, you can launch it from the command line as follows:

```
$ flatpak run com.calibre_
ebook.calibre
```

Once the program starts up, there are a couple of things you'll notice. The first is that you'll have access to all your normal **$HOME** directory files. "But, but," you'll ask, "I thought the Flatpak sandbox was isolated from the rest of the system?" That's very astute of you. However, running a program that can't interact with your files isn't very useful. The Flatpak developers have worked around this.

You should also see entries for the application show up in your desktop's menu. Under most circumstances, you shouldn't be able to tell the difference between these programs and those provided by your distribution. You can operate on your files, play multimedia files, and generally use them as a "normal" program.

MANAGING YOUR FLATPAK INSTALLS

Once you have a Flatpak or two installed, you can, of course, use your GUI package manager to administer them. But if you prefer the terminal, some of the below commands will be useful. You can list the Flatpaks (both apps and runtimes) you have installed with the following command:

```
$ flatpak list
```

The result displays not only the installed modules, but also their installation type (**system/user**). You can update all your Flatpaks with a single command, just like native package managers:

```
$ flatpak update
```

In the event you need to remove a Flatpak, enter the following at the prompt:

```
$ flatpak remove [full-
qualified app name]
```

If you need to remove one of the hubs you've configured, you can do so with the following:

```
$ flatpak remove-remote [name
of remote]
```

CONCLUSION

The benefits of the Flatpak format are numerous. It provides developers with an option to target multiple distributions, while giving users multiple tools to install the resulting applications. It enables programs to access the resources they need, while restricting them from the things they don't. It works around some of the dependency problems of traditional packaging formats, at the expense of a little disk space. Finally, it opens up opportunities for developers to wrap up applications that are traditionally tedious to install in a format that's drop-dead simple.

So if you want to try out the cutting-edge version of LibreOffice or run a Wine-based game like World of Warcraft, give Flatpak a try. You really can't go wrong!

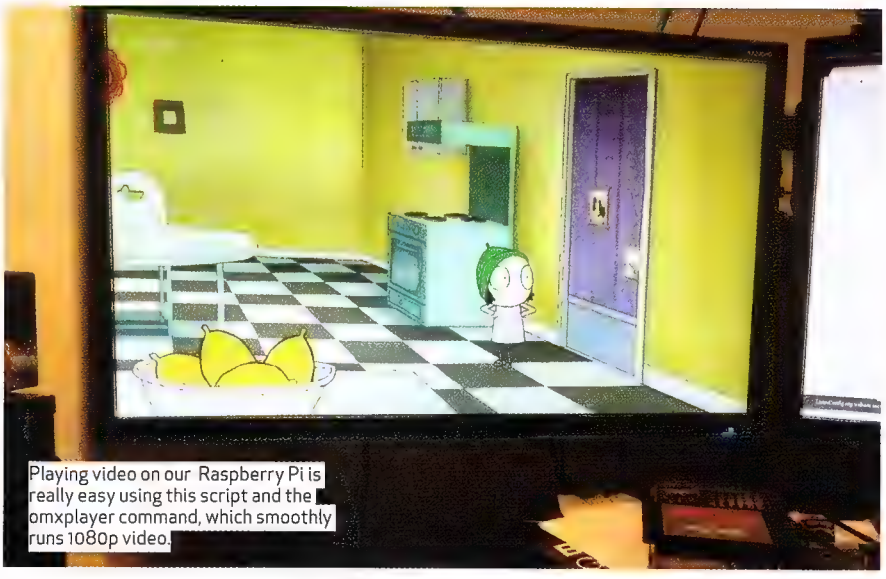
Watch videos easily

Les Pounder loves watching cartoons, and now he can choose a random video on demand! Now all he needs is a giant bucket of popcorn!

Stuck on what to watch this evening with the family? Fear not – with this project we can have our Raspberry Pi randomly choose a video for us to watch. So let's start building and coding our own random video player! All of the code, and a detailed high-res circuit diagram can be downloaded from tinyurl.com/ydctn9kh.

Building the circuit for this project is simple. We only require three buttons, connected to the GPIO at pins two, three and four, and each of these buttons also needs to be connected to GND. For this we can use a single GND pin on the Pi, and a female-to-male jumper wire. Connected to the – rail of a breadboard means that we have multiple GND connections that can be connected via the two male-to-male jumper wires. See the diagram in the download for this project for details.

When the hardware is built, attach the accessories required for your Pi and boot to the Raspbian desktop.



Playing video on our Raspberry Pi is really easy using this script and the omxplayer command, which smoothly runs 1080p video.

TUNE IN

Before we can write any Python code, we need to install two libraries that will help us create the project. Open a Terminal, and type the following:

```
$ sudo pip3 install glob
$ sudo pip3 install keyboard
```

We'll talk more about them later. For now open the Python 3 editor, found in the Programming menu and click File>New to create a new blank file. Immediately click File > Save in the new window. Save the code as VideoPlayer.py and remember to save often!

So now we start writing the code, and our first act is to import the libraries that we require. The first three libraries are used to detect the button presses (GPIO Zero), stop the code from running once and exiting (pause) and to choose a random video (choice.)

```
from gpiozero import Button
from signal import pause
from random import choice
```

The final three imports are a library that we shall use to list the contents of a directory (glob), run terminal commands (subprocess) and the last is a library to emulate a keyboard (keyboard.)

```
import glob
import subprocess
import keyboard
```

Moving on we create three functions–blocks of code that we can later reuse by calling their name. The first function is called play_video and it first creates a list (a data storage object) called videos.

```
def play_video():
    videos = []
```

To fill the list with all the videos we can play, we use a for loop. This will iterate over every file in a directory, as long as it's an mp4 video file. For this we use glob to access the directory /media/pi/Videos, which is really a USB stick called Videos full of mp4 files. Change this to match the name of your chosen directory full of videos. Each time an mp4 is found, it's appended to the videos list that we've just created.

```
    for file in glob.glob("/media/pi/Videos/*.mp4"):
        videos.append(file)
```

Check that the list has been populated with file names by printing the list's contents to the Python shell.

```
    print(videos)
```

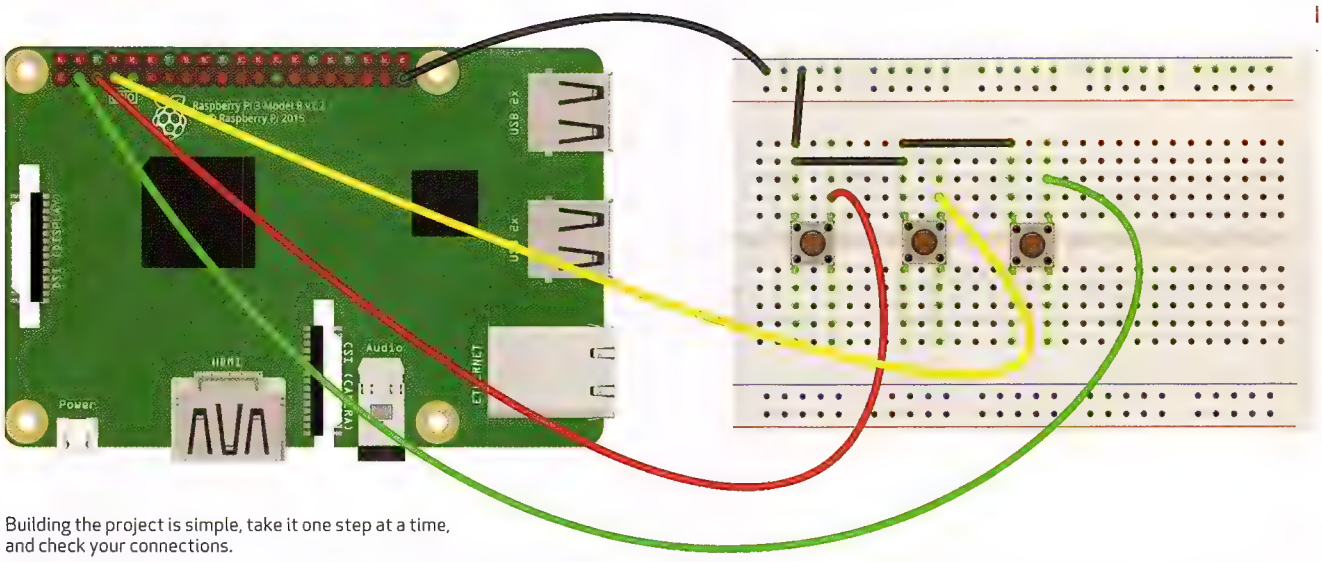
Choose a random video from the list and store it in a variable called chosen. Print this to the Python shell.

```
    chosen = choice(videos)
    print(chosen)
```

The last line in this function uses the

```
File Edit Format Run Options Window Help
from gpiozero import Button
from signal import pause
from random import choice
import glob
import subprocess
import keyboard

def play_video():
    videos = []
    for file in glob.glob("/media/pi/Videos/*.
        videos.append(file)
    print(videos)
    chosen = choice(videos)
    print(chosen)
    subprocess.Popen(['omxplayer',(chosen)])

def stop_video():
    keyboard.press_and_release('q')

def pause_video():
    keyboard.press_and_release('space')

randomiser = Button(2)
stop = Button(3)
pause_button = Button(4)
try:
    print("Press the GREEN button to start\nYE
    randomiser.when_pressed = play_video
    stop.when_pressed = stop_video
    pause_button.when_pressed = pause_video
    pause()
except KeyboardInterrupt:
    print("\nEXIT")
```

There are only 34 lines of code in this project, and yet we've created a simple media player that can handle 1080p video playback.



Building the project is simple, take it one step at a time, and check your connections.

Popen class from the subprocess library to run a command as if we were sat at the terminal, and this command is to open the omxplayer media player, then play the chosen video.

```
    subprocess.
Popen(['omxplayer',(chosen)])
```

The next function is called stop_video and as you can guess it will stop the currently playing video. For this we use the keyboard library, specifically the press_and_release function to simulate pressing Q.

```
def stop_video():
    keyboard.press_and_
release('q')
```

The last function is called pause_video and it emulates pressing the space bar on the keyboard, which is how omxplayer pauses video.

```
def pause_video():
    keyboard.press_and_
release('space')
```

With the functions created, we next need to tell our code where our buttons are connected. We have three buttons connected: randomiser (play), stop and the pause_button. These buttons are connected to the GPIO at pins two, three and four, respectively.

```
randomiser = Button(2)
stop = Button(3)
pause_button = Button(4)
```

PUSH THE BUTTON!

On to the last part, which looks for a video when a button is pressed, and reacts accordingly. But first we wrap this section in an exception handler. It'll try to run the code, but if the user presses Ctrl+C then the code will exit. So for the try section our code will first print three lines to the shell – these are the instructions to the user. The \n between each colour is Python shorthand to insert a new line between each instruction:

```
try:
    print("Press the GREEN
button to start\nYELLOW to
pause\nRED to stop")
```

Our three buttons are waiting to be pressed, and using the GPIO Zero library we call the when_pressed class to detect when each of the buttons are pressed. When this happens the corresponding function is run. So when we press the Green randomiser (play) button it'll randomly choose a video from the USB stick and play it. You'll notice that the functions don't have a () at the end of the function name. This is because if they did, then the code would run automatically. Right now they're ready to run on demand.

```
    randomiser.when_pressed =
play_video
    stop.when_pressed =
stop_video
    pause_button.when_pressed
= pause_video
```

The last line in this section is a simple pause(), and this is used to keep the code running, and not just exiting after running once.

```
    pause()
```

But what happens if the user presses Ctrl+C? Well this is a Keyboard Interrupt and if that occurs we shall simply print an empty line and then Exit on the screen.

```
except KeyboardInterrupt:
    print("\nEXIT")
```

So now save your code, and open a Terminal to the directory where you have saved the code. In order to use the code we need to run it with sudo (root powers) because the keyboard library used in the project can only be used as root. To run the code type:

```
$ sudo python3 VideoPlayer.py
```

Press the Green button to play the randomly chosen video, to pause press Yellow, and to stop press Red.

Keyboard shenanigans

In this project we used the Keyboard Python library to emulate a keyboard using just the push buttons that controlled playing, pausing and stopping video playback.

The Keyboard library can be used to press any keys, so we can automate multiple key presses all from one push button. The library can also be used to write text to the screen.

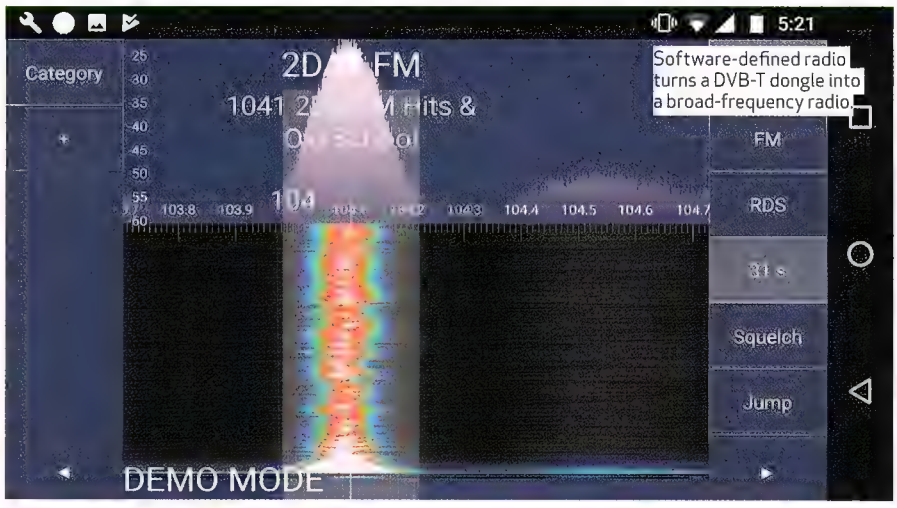
But the most dangerous function of this library is that it can be used to record every key press on the target machine. These key presses can be recorded to a list, then saved to a file and then used for nefarious purposes. Of course, recording the key presses of a user, without their consent is illegal and can land you in a lot of trouble. So don't do it! With that said, it can be used as a powerful tool when debugging how a user interacts with your code, so for software testing (under consent with the general public and in-house testers) you can see what keys they were pressing right before the code locked up and/or went thermonuclear!

The Keyboard library works with Linux and Windows and it's certainly lots of fun to play with. To read a little more about this library head over to this blog post **https://bigl.es/tuesday-tooling-record-replay-keystrokes-with-python** and see a few examples of how it can be used in day-to-day life.

Seven unusual reasons to revive your old Android device

Don't toss that old Android phone. Darren Yates lines up seven cool and unusual applications to breathe life back into your favourite old mobile device.

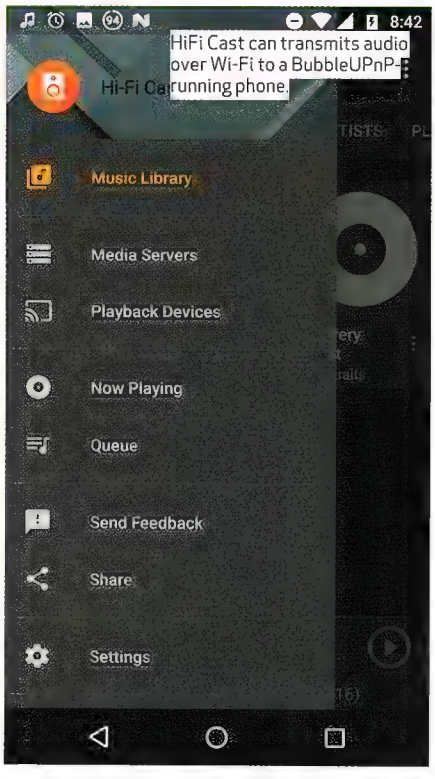
If Google's own stats are anything to go by, plenty of users around the world are hanging on to their older Android devices. Android's distribution dashboard (developer.android.com/about/dashboards) showed half of all Android devices accessing the Google Play store during the week of 26 October 2018 were running Android 6.0/Marshmallow or older. Most of us have discarded mobile devices lining draws and holding up cupboards, but you might be surprised at what these portable battery-powered multi-core marvels can still do. Here are seven of my favourite (and somewhat unusual) reasons for keeping older devices productively employed – what's more, none of them require root-access or hacked firmware.



"Most phones are capable of picking up FM radio stations in the 88-108MHz band using your earphones as an antenna."

MAKE A SOFTWARE-DEFINED RADIO (SDR)

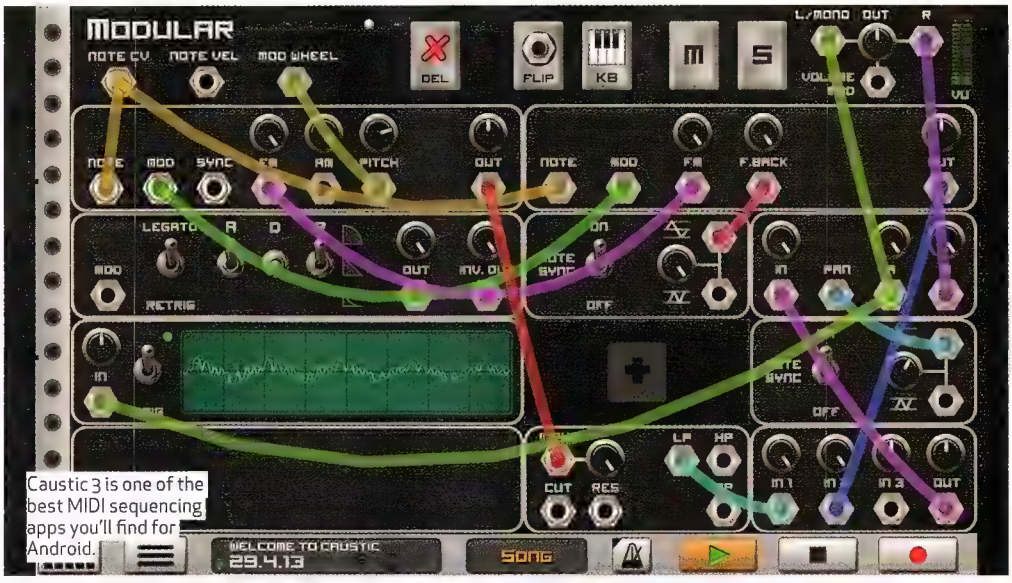
Most phones are capable of picking up FM radio stations in the 88-108MHz band using your earphones as an antenna, but with the addition of a Digital Video Broadcasting – Terrestrial (DVB-T) USB tuner, it's possible to turn many phones into ultra-wideband radio receivers. They then cover a spectrum range from around 50MHz to as high as 2200MHz (2.2GHz), picking up standard free-to-air FM stations, but also aircraft, emergency services and so on. Most local retailers warn you should check the legality of listening to some frequencies in your area before you start, but these devices are sold by many electronics retailers in Australia. The key components are the chips – Realtek's RTL2832U DVB-T signal demodulator and Rafael Micro's R820T2 radio tuner. Earlier this year, Rafael Micro discontinued the R820T2, however, there are still plenty around, particularly on eBay for about $10. You'll need two apps from Google Play – the RTL2832U driver app by Martin Marinov (**tinyurl.com/qf3zz9l**), along with an SDR app, of which there are a few. Start with SDR Touch (**tinyurl.com/k8oo58n**), written by the same developer. Your Android device needs at least Android 4.0 and USB-OTG support.



WATCH FREE-TO-AIR TV

Yes, we know you can watch free-to-air TV networks via the web, but I've personally found the results can be sometimes inconsistent, with weird time-jumps and poor video quality, particularly when your connection is bandwidth-limited. The other issue is that free-to-air TV isn't free when you're paying for data. PCs may have had USB DVB-T tuners for years, but it's a relatively recent thing on Android devices. Again, if you have at least Android 4.0 plus a USB-OTG port and USB-OTG cable, you can use the same RTL2832U/R820T2 dongle above to also pick up the free-to-air DVB-T digital TV stations. The bonus here is it's all data-free because you're receiving the same radio signals your TV picks up, except you're watching on your phone or tablet instead. You'll need the RTL2832U driver app above, plus Aerial-TV (**tinyurl.com/yd5e5gv7**), an app that turns the

Torque Lite lets your phone wirelessly link to an OBD-II dongle in your car.



Caustic 3 is one of the best MIDI sequencing apps you'll find for Android.

digital data picked up by the USB dongle back into images on your device screen. It'll cost you around $10, but it does the hard work of automatic channel scanning and displaying the video feed. Sure, it might be a bit cumbersome, but it's the only technique that doesn't rely on your home Wi-Fi network or even having phone network connectivity to pick up a TV signal.

MAKE YOUR OWN CHROMECAST AUDIO

Old-school Bluetooth audio relying on basic Sub-Band Compression (SBC) isn't known for its scintillating quality, which is why Sony, Qualcomm and Google have all put in hard yards recently to improve the range of wireless audio codecs available. Qualcomm's AptX-HD and Sony's LDAC arrived in Oreo/8.x to boost the sparkle in your favourite music when using compatible Bluetooth headphones and speakers. Google's Chromecast Audio provides a Wi-Fi-powered alternative that overcomes Bluetooth's bandwidth limitations and delivers HD audio. However, you can make your own Chromecast Audio with an Android phone. Install BubbleUPnP (**tinyurl.com/ybdmdk39**) onto your old device and plug the headphone socket into your audio system. Launch BubbleUPnP and connect your phone to your home Wi-Fi network. Next, install HiFi Cast (**tinyurl.com/y7mgqz2w**) onto your current phone. Launch the app, allow it to access your music files, then when the main app window appear, tap the hamburger side-menu button on the top-left and choose 'Playback devices'. Tap the new 'BubbleUPnP' entry it picks up, go back to the main screen, select a song to play and it should play on your old device and out through your sound system. We recommend an old quad-core device with at least Android 4.4/KitKat for playback (and just quietly, you might be surprised how good it sounds).

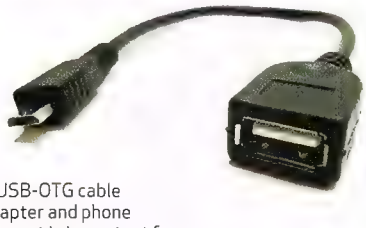
HACK YOUR CAR

Every car sold in Australia for at least the last ten years has featured an On-Board Diagnostics-II (OBD-II) interface to your car's engine-control unit or ECU (mechanics use this to test brake performance during the annual rego-check). Low-cost Bluetooth OBD-II dongles allow you to tap into this data using your PC or Android device. Most of the sub-$10 OBD-II dongles sold on eBay use unlocked firmware from ELM Electronics' original ELM-327 chip. Still, the two dongles we purchased worked well. You'll need the popular Torque Lite app from Google Play (**https://tinyurl.com/b22mt8y**), while the OBD-II dongle plugs into the OBD-II socket, usually located under the dashboard between the steering column and the driver's side door. Torque Lite allows you to data-log your driving, monitor acceleration, speed, engine performance data and much more. Pair your Android device with the dongle over Bluetooth, then link to it with the Torque Lite app. Use it to monitor and hack your driving – for example, learn smoother acceleration to reduce component wear and fuel consumption.

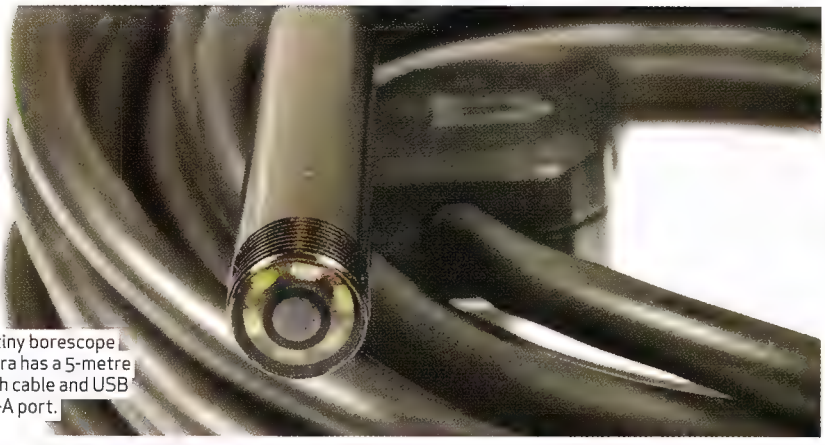
NOTE: Cheap dongles come with no warranty and although we experienced no adverse effects during testing you use them at your own risk.

DVB-T dongles with RTL2832/R820T2 chips pick up radio and TV signals.

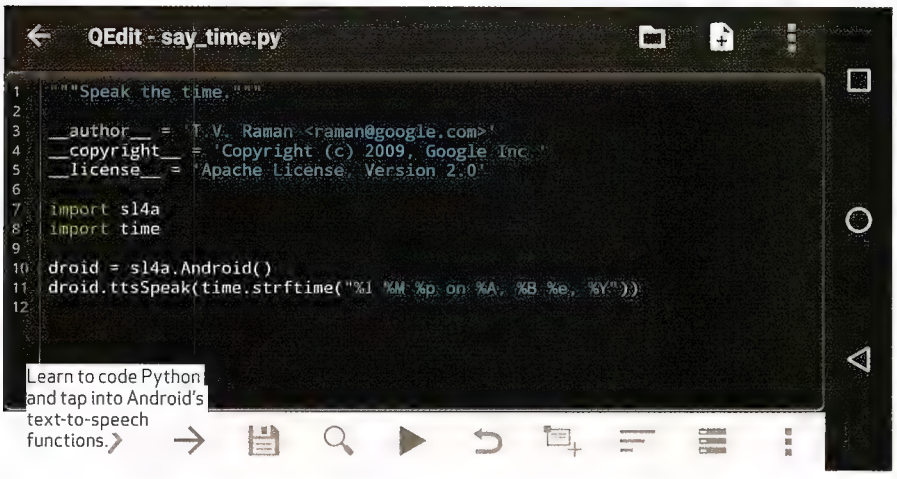
A USB-OTG cable adapter and phone support is important for many projects.



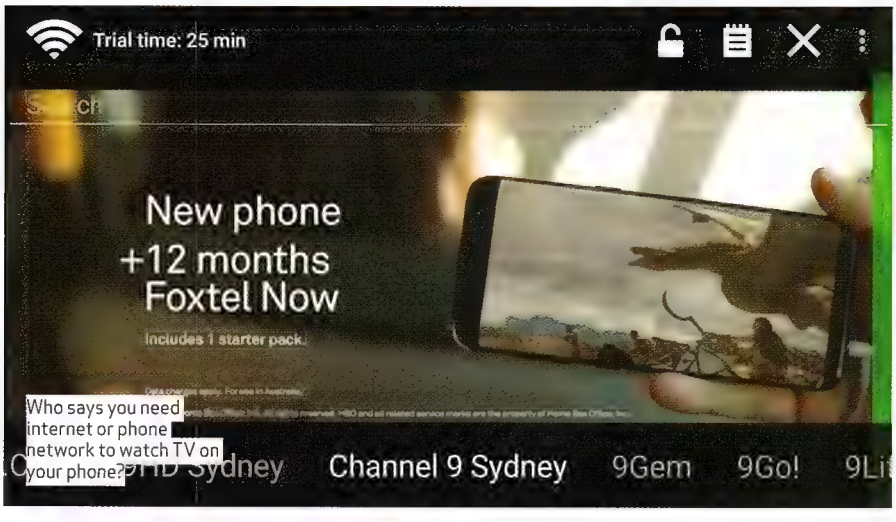
Cheap OBD-II dongles with on-board Bluetooth sell on eBay for under $10.



This tiny borescope camera has a 5-metre length cable and USB Type-A port.


QEdit - say_time.py
"""Speak the time."""
__author__ = 'T.V. Raman <raman@google.com>'
__copyright__ = 'Copyright (c) 2009, Google Inc.'
__license__ = 'Apache License, Version 2.0'
import sl4a
import time
droid = sl4a.Android()
droid.ttsSpeak(time.strftime("%l %M %p on %A, %B %e, %Y"))

Learn to code Python and tap into Android's text-to-speech functions.



Who says you need internet or phone network to watch TV on your phone?

MAKE AN INSPECTION CAMERA

Most phones already feature two cameras, so why would you want another? How about one on the end of a long thin cable you can squeeze into wall cavities to see what's going on. An inspection camera here – also called a 'borescope' – is essentially a tiny VGA image sensor with half a dozen white LEDs on the end of a long cable and a Type-I USB connector on the other end. You connect it via a USB-OTG cable to compatible phones, turning them into a cheap inspection camera screen. These cameras sell on eBay for as little as $10 and come in one, three, five and ten metre lengths. The trick is getting the software and camera talking to each other. First, you need USB-OTG support and a USB-OTG cable. Next, your device needs UVC (USB Video Class) driver support – this is less common, but began appearing in Lollipop/5.x. After that, you need video apps – the ones we've tried with success are CameraFi (**tinyurl.com/y7fepo5y**), UsbWebCamera (**tinyurl.com/qg9xhgq**) and EasyCap & UVC Player (**tinyurl.com/yblv4nbm**). However, your mileage may vary. VGA-spec cameras will give you basic vision – just don't expect 4K quality, no matter how good your screen is. Still, they beat squeezing your phone through the wall...

MAKE A MIDI SEQUENCER

If you love listening to music, chances are you probably love making it and anyone who's ever dabbled into making music will have come across the Musical Instrument Digital Interface (MIDI for short). While it's normally used with musical keyboards, sequencers and PCs, Google began including MIDI support into Android starting with Marshmallow/6.0. So again, provided your Android device has USB-OTG support, you can turn it into a MIDI sequencer by installing a USB MIDI interface and a suitable app. The two apps we suggest you try are Caustic 3 (**tinyurl.com/yb2affeo**) and Audio Evolution Mobile Studio Trial (**tinyurl.com/pe2vmw8**). The former is an excellent MIDI sequencer for creating your own music tracks; the latter, a digital audio workstation that can combine MIDI and audio tracks together, even add in your own real-time effects. One of the key issues with MIDI is 'latency', the time it takes for audio data to make the trip from keyboard controller to audio track. This is an area where Android is slowly improving, but you need a device with at least 6.0/Marshmallow to approach the best the OS can do, plus a quad-core CPU for the speed wouldn't hurt, either.

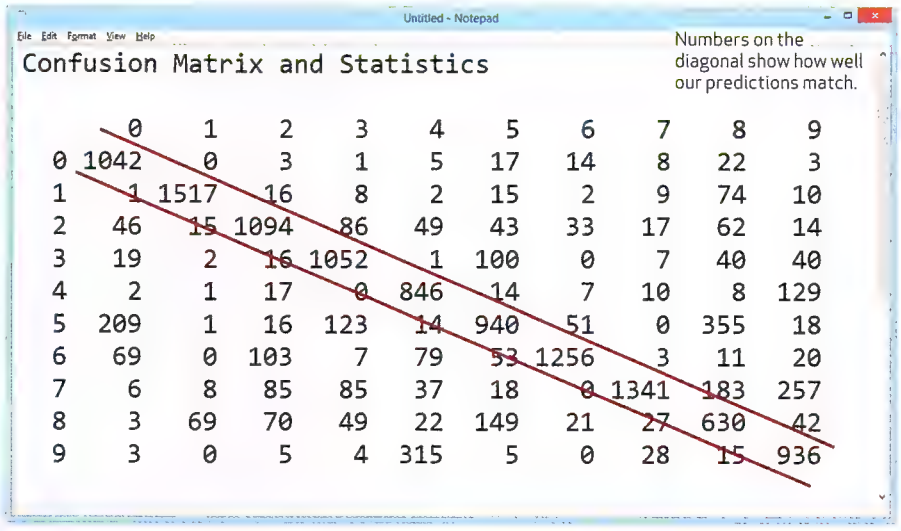
LEARN TO CODE PYTHON

Personally, I'm all for everyone learning to code – whether you're eight years old or 80. If you can update your Facebook page or send a million tweets, there's no reason not to try coding on your Android device. The overwhelming majority of Android apps are developed using the Java programming language, but if even programming your Foxtel box is a stretch for you, Python is a great programming language to start with. It's easy to learn and in most surveys, Python comes out on top as the world's most popular programming language. You can install it on Windows, macOS and Linux, but you can also run it on almost any Android device. QPython (**tinyurl.com/n8eg864**) is free on Google Play and it has some awesome capabilities. Not only does it handle all the Python basics, but you can tap into cool Android extras such as Bluetooth and speech recognition. There's a 'getting started' guide at **qpython.org/en/guide_howtostart.html** and from there, any Python 3 textbook will give the basics to begin coding. It might seem like overkill, but when you're stuck on public transport looking for something to do, learning to code is a productive way to kill an hour or two each day.

Computer vision and artificial neural networks

Can a computer really think like a human brain and recognise objects in an image? Darren Yates explains how it's done using machine-learning.

Any way you think about it, driverless cars are pretty clever tech. Even just the ability of a car's on-board computer to recognise obstacles in real-time and direct the vehicle to safely avoid them is clever stuff. However, it's only one application of this tech broadly known as 'computer vision' that's making waves. Facial recognition is fast becoming a hot-button issue, but putting the ethics, security and privacy issues aside for the moment, how does it actually work? It's a huge, complex research area globally, so this month, we're looking at the basics of computer vision and our first peak into another broad buzzword area in tech at the moment – 'deep learning'.


Untitled - Notepad
File Edit Format View Help
Confusion Matrix and Statistics
Numbers on the diagonal show how well our predictions match.

	0	1	2	3	4	5	6	7	8	9
0	1042	0	3	1	5	17	14	8	22	3
1	1	1517	16	8	2	15	2	9	74	10
2	46	15	1094	86	49	43	33	17	62	14
3	19	2	16	1052	1	100	0	7	40	40
4	2	1	17	0	846	14	7	10	8	129
5	209	1	16	123	14	940	51	0	355	18
6	69	0	103	7	79	53	1256	3	11	20
7	6	8	85	85	37	18	0	1341	183	257
8	3	69	70	49	22	149	21	27	630	42
9	3	0	5	4	315	5	0	28	15	936

DEEP LEARNING 101

If there's one part of the human body we're still far from figuring out, it's the brain. That grey matter inside your skull is a complex network of cells or 'neurons' joined together by connections called 'synapses'. This structure is commonly said to be the inspiration for a type of machine-learning popularly known as 'deep learning'. Google offers it as a service known as 'TensorFlow' and Facebook uses it in face recognition.

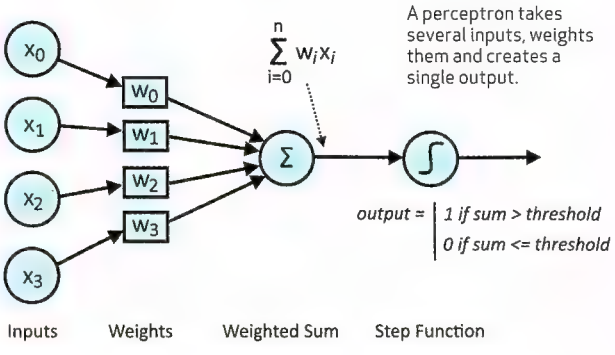
At its simplest, deep learning attempts to model this brain-like structure through a group of machine-learning techniques collectively called 'artificial neural networks' (ANNs), which are basically an interconnected network of artificial neurons. There are different types of neurons, but a neuron in machine-learning is just a mathematical building-block or equation that takes in several input parameters, weighs up those inputs according to different criteria and produces an output. Now don't get the idea that deep learning fell from the sky yesterday; it didn't – the neuron I've just described is called the 'perceptron'. It was developed in 1957.

PERCEPTRONS

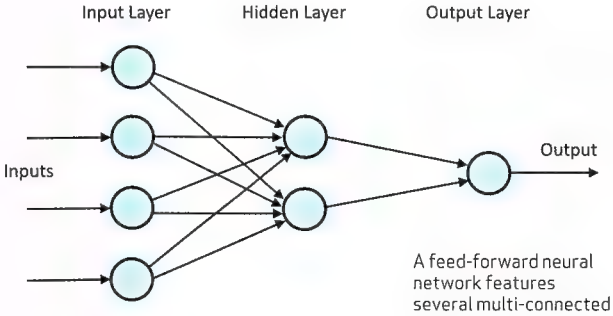
If you want to draw it out, you can see an example of a perceptron in Figure 1. It has four inputs with values x0, x1, x2 and x3, respectively. Each of these inputs also has a weight, w0, w1, w2 and w3, usually a decimal number between 0 and 1 that's multiplied with its associated input to determine how much importance we give it. These values are then added together to give a single number – if that number is less than or equal to a certain threshold, the output of the perceptron is considered '0'; if it's greater than that threshold, the output is set to '1'.

HOW IT WORKS

We can use this perceptron to help us decide whether to buy the iPhone XS Max phone or the Pixel 3 XL. Let's say there are four features we're interested in – screen size (x0), price (x1), battery life (x2) and CPU speed (x3). All four inputs are binary, which means if we decide the Pixel 3 XL wins on a feature, we'll score it '1', if the XS wins, it scores a '0'. However, not all four features have the same importance to us – for example, price is more important than CPU speed and battery life more important than screen size. So, we create weight values for these inputs – the higher the



A perceptron takes several inputs, weights them and creates a single output.



A feed-forward neural network features several multi-connected perceptrons.

```
#-------------------------------------------------------------------------------
# Kaggle Digit Recognizer competition - R-script - v1
# Darren Yates - 18-Nov-2018
library(nnet)
library(caret)
#-------------------------------------------------------------------------------
# NOTE: change the filePath below to suit your
filePath = "C:\\Users\\Darren\\Downloads\\all\\"
trainFile = "train.csv"
testFile= "test.csv"
#-------------------------------------------------------------------------------
# Section 1 - read data
print(": Reading in the datasets...")
dtrain <- data.matrix(read.csv(paste(filePath,trainFile,sep="")))
dtest <- data.matrix(read.csv(paste(filePath,testFile,sep="")))
#-------------------------------------------------------------------------------
# Section 2 - adjust settings, create matrices from training set
set.seed(3801)
options(max.print = 14000)
trainrows <- sample(nrow(dtrain),size = 0.66*nrow(dtrain))
trainSubNonClass <- dtrain[trainrows,]
testSubNonClass <- dtrain[-trainrows,]
trainSubClass <- factor(unlist(trainSubNonClass[,1]))
testSubClass <- factor(unlist(testSubNonClass[,1]))
#-------------------------------------------------------------------------------
# Section 3 - build our neural network model
print(": Building NN model...")
test <- nnet(trainSubClass~., data = trainSubNonClass[,-1], size = 10,
             decay = 0.001, maxit = 50, MaxNWts = 50000)
#-------------------------------------------------------------------------------
```

```
Neg Pred Value         0.95890
Prevalence             0.10287
Detection Rate         0.06555
Detection Prevalence   0.09181
Balanced Accuracy      0.80395
[1] ": Testing the NN model against the genuine test.csv dataset..."
[1] "All done (output CSV file is in /documents folder."
>
```

Our first Neural Network R-script written in RStudio.

weighting, the more important it is. Let's say we give screen size (w0) a weight of 0.2, price (w1) 0.8, battery life (w2) 0.6 and CPU speed (w3) 0.4. Now we look for the phone specs:

The iPhone XS Max has a larger screen, so the x0 input is '0' (i.e. XS Max wins).

The Pixel 3 XL is cheaper, so the x1 input is '1'

The Pixel 3 XL has longer battery life, so the x2 input is '1'

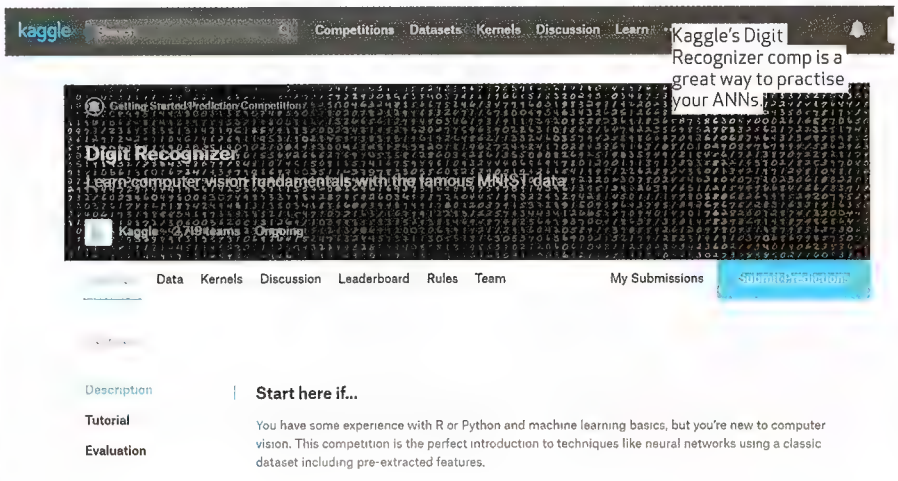
The iPhone XS Max has greater speed, so the x3 input is '0'

We'll set our threshold level to '1' – that means if the weighted sum is greater than '1', we buy the Pixel 3 XL; otherwise, it's the iPhone XS Max. The way we calculate the perceptron output is by doing this:

```
output =    w0x0 + w1x1 + w2x2 + w3x3
  =     (0.2 x 0) + (0.8 x 1) + (0.6 x 1) + (0.4 x 0)
  =     0 + 0.8 + 0.6 + 0
  =     1.4
```

Since the output of 1.4 is greater than one, we buy the Pixel 3 XL. No doubt you can see that the final result depends highly on the weights and the threshold level – change these around and you get a completely different result. Technically, there's no limit to the number of inputs you can include, either.

Sure, this might be a simple example. Nevertheless, it is how we often go through the buying process – we weight up the factors most important to us, compare features and make a decision. A perception just makes this a more mathematical process.

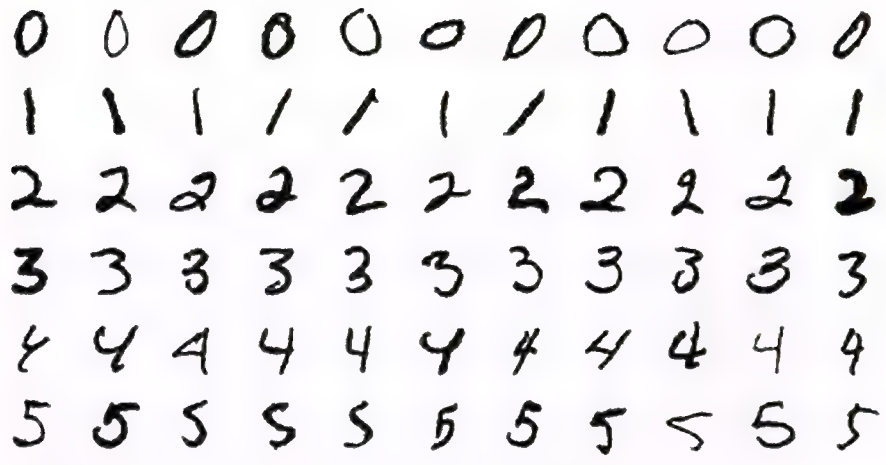


Kaggle's Digit Recognizer comp is a great way to practise your ANNs.

MULTI-LAYER PERCEPTRONS

In reality (thankfully), the neurons in our brains aren't quite that simple. Still, where it gets really interesting from a machine-learning viewpoint is when you start combining these perceptrons together to form a network. One of the simplest artificial neural networks is called the 'multi-layer perceptron' or 'feed-forward neural network' shown in Figure 2. It consists of three layers of perceptrons – the first layer is the 'input layer', which takes the input values and applies each value to each input perceptron. That's followed by the 'hidden layer'. The perceptrons in this layer take their inputs from the output of each of the input layer perceptrons. Finally, the outputs from the hidden layer are added together at the 'output layer', where the final output is taken. It is possible to have more than one hidden layer, but in reality, few applications need a second one.

How many perceptrons do you need in total? Basically, you need one perceptron for each input on your input layer and often, you only need one perceptron at the output. However, there's no hard and fast rule for setting the number of hidden layer perceptrons, but typically you choose fewer than the input layer and more than the output layer. In this drawn example, we've chosen two.



The MNIST dataset is the 'hello world' of computer vision learning.

```
22 testSubNonClass <- dt[-trainrows,]
23 trainSubClass <- factor(unlist(trainSubNonClass[,1]))
Console  Terminal

Restarting R session...

> install.packages("caret")
Installing package into 'C:/Users/Darren/Documents/R/win-library/3.5'
(as 'lib' is unspecified)
trying URL 'https://cran.rstudio.com/bin/windows/contrib/3.5/caret_6.0-80.zip'
Content type 'application/zip' length 6114003 bytes (5.8 MB)
downloaded 5.8 MB

package 'caret' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
        C:\Users\Darren\AppData\Local\Temp\R[redacted]d\downloaded_packages
>
```

Run the two 'install.packages' console commands before you run the script.

COMPUTER VISION

As we mentioned before, computer vision is a popular application of ANNs. The data science competition website, Kaggle, has an open competition called 'Digit Recognizer'. It's based on the popular MNIST dataset of handwritten images. It consists of 70,000 images, each image is 28x28-pixels (784 pixels in total) and shows a handwritten digit selected from 0 to 9. The image data has been translated so that each image is now a single row in the dataset and each column covers one of those 784 pixels with a value between 0 and 255 representing the 8-bit greyscale colour of that pixel. Add in a class attribute, which is a label of the actual digit the image attributes represent and you have 785 columns. The Kaggle version consists of 42,000 training images and 28,000 test images. Our task is to learn a model from the 42,000 training images, then use that model to predict the digits drawn in each of the 28,000 test images (which have no digit labels), submit the predictions to Kaggle and see how good our model is.

Over the last few months, we've used the R programming language and RStudio IDE to create submissions for Kaggle competitions. These are both free and open-source – you'll find R at the CSIRO's CRAN mirror (**cran.csiro.au**) and the free RStudio Desktop at **rstudio.com/products/rstudio/download**. You need to install R before RStudio, then launch RStudio. You'll find the dataset for this competition at **kaggle.com/c/digit-recognizer/data**. You also need a Kaggle account to get the data – it's free to sign up.

GRAB THE DATA

Head to **www.kaggle.com/c/digit-recognizer/data** and half-way down, you'll see a 'Download All' button on the right-side. Click it. The file is 15MB. Unzip it and you'll see three files – sample_submission.csv, test.csv and train.csv. The first is the format your submission file must take to be accepted by Kaggle's input systems. The second file is the one you create your model from. The third file is the one you use to test your model against.

GRAB THE SOURCE

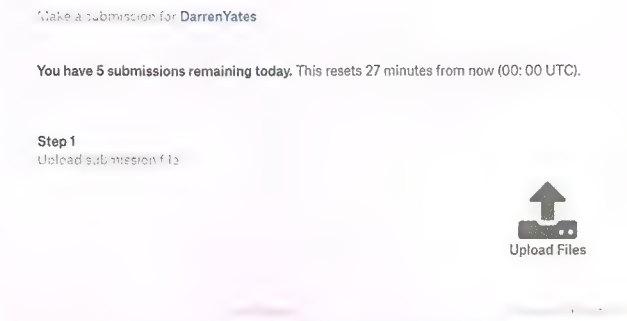
We don't have enough space to go through the whole process this month, so download our R-script from the website at **http://apcmag.com/magstuff**. Load it into RStudio. Before you run it, you'll need to run a couple of commands in RStudio's console area:

```
install.packages('caret')
install.packages('nnet')
```

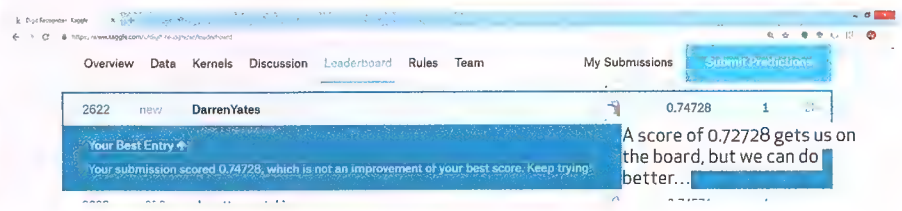
The first command installs the 'caret' package, which includes an excellent confusion matrix function, while the second provides us a feed-forward neural network library.

RUN THE CODE

Once the library packages are installed, press the 'source' button on the top-right of the code editor panel in RStudio and it'll go to work. Our source script is only single-threaded - that means it'll take a bit of time (about five minutes) to build the neural network model. Just briefly, our R-script takes the training dataset and splits it 66:34 into two subsets, one for training the model and one for testing or 'validating' it. The confusion matrix tells us how well our neural network model did on predicting the digit images in the validation subset. Once that's done, we then let the model loose on the actual test dataset. When complete, we write the results automatically to a .csv file. You submit that file to Kaggle and see how you go on the leaderboard. This, we did – but only managed 2,623th position out of 2,718. That's pretty low, but not really surprising. This initial script does work, but so that you're not sitting around forever waiting for it, we designed it more for speed than accuracy. Next time, we'll explain how you tune a neural network to improve accuracy – and get a better Kaggle score!


Make a submission for DarrenYates
You have 5 submissions remaining today. This resets 27 minutes from now (00: 00 UTC).
Step 1
Upload Files

Drag your output csv file to the Kaggle page, press the Submit button below.



A score of 0.72728 gets us on the board, but we can do better...

World of Warcraft's most infamous disaster is becoming a Hearthstone card

THE UPCOMING RASTAKHAN'S RUMBLE WILL PAY HOMAGE TO HAKKAR THE SOULFLAYER AND THE CORRUPTED BLOOD INCIDENT.

On September 13, 2005, a player returned from the gruelling new Zul'Gurub raid and summoned his pet in one of Azeroth's capital cities only to find that, due to a bug, the pet had acquired a debuff that wasn't supposed to exist outside of the raid. Called Corrupted Blood, this negative effect would deal constant damage to its target until they died — but even worse was the fact that it was highly contagious. Anyone within a certain range of an infected player automatically contracted the disease and soon died. In a matter of hours, *World of Warcraft*'s capital cities had become ground zero of a deadly plague, and they stayed that way for over a week.

And now, 13 years later, *Hearthstone* is finally paying tribute to that cataclysmic moment in its own, cool way. Meek Hakkar, the Soulflayer, the boss from which corrupted blood originated, now transformed into a *Hearthstone* card.

The idea here is that, with enough unlucky draws, a player could fill their deck up with Corrupted Blood and eventually — like *WoW* players of yore — fall victim to it.

Blizzard is working on a *Warcraft* mobile game

...INSPIRED BY POKEMON GO.

Blizzard is reportedly working on a *Warcraft* mobile game based on *Pokemon Go*, the mobile critter collector. According to a Kotaku report, this game's development was spurred by three main factors. Firstly, and most obviously, Blizzard loves *Warcraft*. Secondly, lots of Blizzard staff love Pokemon Go, with many employees apparently routinely warring over the Pokestop statue in the middle of the studio's Irvine, California, campus. And thirdly, according to one anonymous employee, many Blizzard employees enjoy playing mobile games and want to try making them.

Nier: Automata Game of the Yorha Edition spotted in ESRB ratings

Looks like 2B and the gang are back — again.

N*ier: Automata*, Platinum Games' action-packed robot drama, is getting a Game of the Year edition, according to the ESRB. *Nier: Automata Game of the Yorha Edition* recently appeared in the organisation's official ratings board, which is sound evidence of an impending release, though Platinum Games has not officially announced anything at the time of this writing.

Nier: Automata originally released in February 2017, and it received a Game of the Year-esque revamp on Xbox One earlier this year with the release of its *Become As Gods Edition*. This special edition came with the game's only major DLC — confusingly titled 3C3C1D119440927 — which includes new arena challenges that award extra outfits for protagonists 2B, 9S, and A2. The challenges themselves are difficult and delightfully silly, with some featuring boss fights with Square Enix president Yosuke Matsuda and Platinum Games president Kenichi Sato. Yes, really.

So, what's in the *Game of the Yorha Edition*? I mean, it will presumably come with everything in the *Become As Gods Edition* and then some, so what's new? Maybe some *Soul Calibur 6* crossover trappings, or some new cosmetics or subquests?

"The challenges themselves are difficult and delightfully silly, with some featuring boss fights with Square Enix president Yosuke Matsuda and Platinum Games president Kenichi Sato. Yes, really."

Bethesda cops huge backlash following Fallout 76 launch

The online multiplayer spin on Fallout has not been well received.

Fallout 76 has triggered a number of outcries and controversies since it launched in November, ranging from the perceived poor quality of the game through to some other more serious debarcles. While the game's low Metacritic score can mostly be blamed on its launch woes, Bethesda has copped it severely for what has been dubbed in some circles "bag-gate". In an expensive collector's edition of the game a canvas bag was advertised, however upon launch this bag proved to be made of nylon. Riding the momentum of the game's critical backlash, consumers and fans picketed Bethesda so hard that the company were forced to manufacture a new set of bags as a replacement.

But that's not where the pain ended for Bethesda: those seeking a replacement for their inferior nylon bag were required to file a support ticket on Bethesda's website. It later emerged that many of these support tickets were viewable by other users of the service, resulting in a serious privacy breach. Although fewer than "123" users were affected, it compounded the grief surrounding what was the most controversial game launch in 2018.

The company behind Fortnite has launched a rival to Steam

THE EPIC GAMES STORE ALREADY HAS A NUMBER OF EXCLUSIVES.

Epic Games, the company responsible for *Fortnite* and *Gears of War*, has launched its own PC gaming storefront. The Epic Games Store is designed to be a rival to Valve's market-dominating Steam platform, and while its current library is tiny compared to the competition, it's managed to launch with a handful of platform exclusives. These include *Ashen*, a much-anticipated action RPG, as well as the PC release of *Journey*, which has previously been exclusive to PlayStation consoles. To sweeten the deal, users of the Epic Games Store will receive one free game every fortnight throughout 2019.

The launch comes amid mounting criticism of Steam, with Valve's revenue share policy coming under scrutiny in December, with many criticising a structure which sees more popular games attracting a smaller cut from Valve, thus handicapping niche and low-selling titles. Epic Games will grant 88% of all sales to the developer. It's tough to crack the PC marketplace space in the shadow of a behemoth like Steam, but with *Fortnite* under its belt, Epic Games is arguably the best positioned company to do so.

Counter-Strike: GO goes free-to-play, gets battle royale mode

VALVE FUTURE-PROOFS ITS ESPORTS DOMINATING FPS.

In a surprise move at the end of 2018, Valve transitioned its popular competitive FPS *Counter-Strike: Global Offensive* to a free-to-play model. Following the sudden announcement, the studio also released a new battle royale mode for the tactical shooter. The 18-player mode is not as grand in scale as competitors *PUBG* or *Fortnite*, but it retains the close-quarters combat style of the vanilla game, while adopting a last-man-standing format.

Far Cry: New Dawn is an apocalyptic spin on its popular predecessor

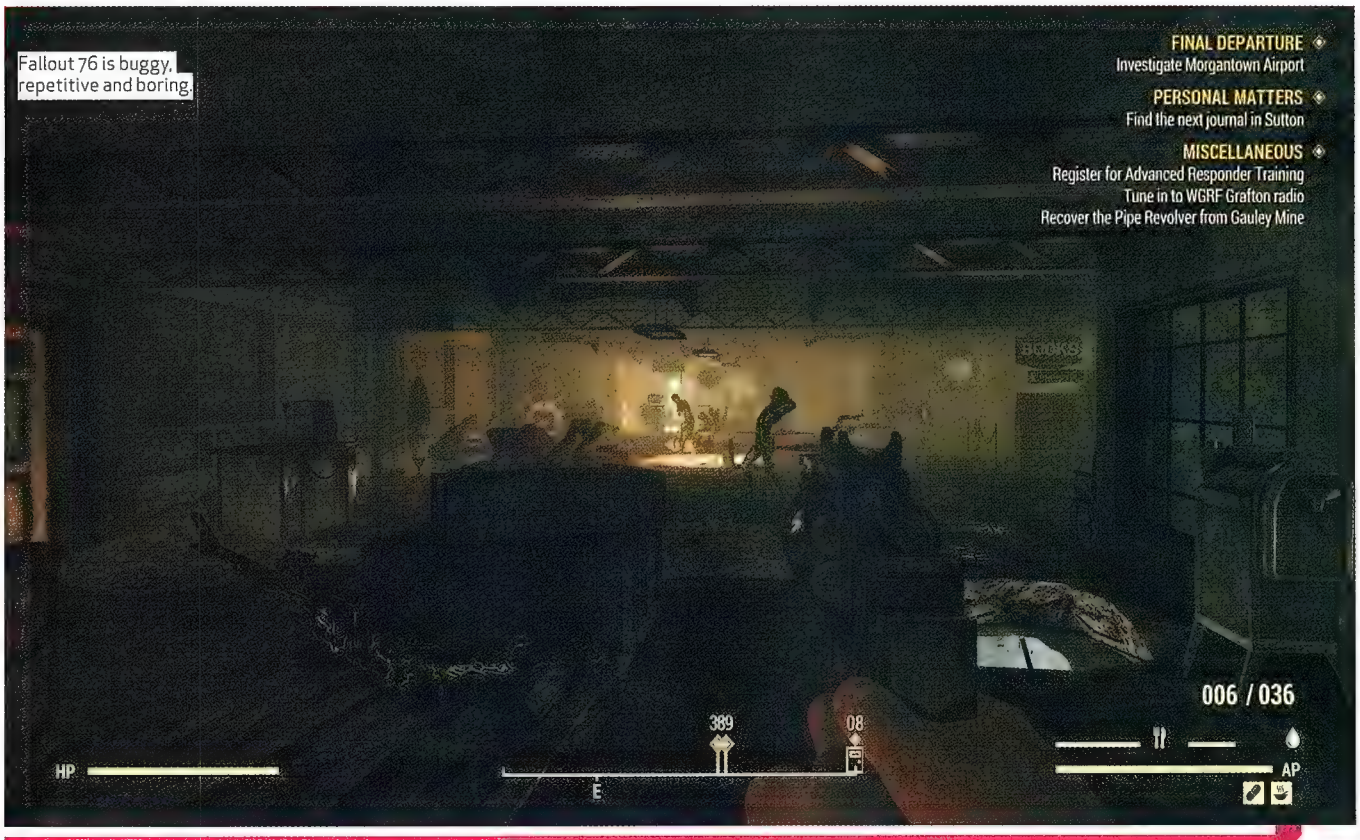
UBISOFT SET TO RELEASE COLOURFUL SPIN-OFF IN FEBRUARY.

Following the success of 2018's *Far Cry 5*, Ubisoft has announced a spin-off in the form of *Far Cry: New Dawn*, which follows in the footsteps of other series spin-offs including *Far Cry: Primal* and *Far Cry: Blood Dragon*. It's set in the immediate aftermath of *Far Cry 5*, and features a colourful and anarchic art-style befitting a post-nuclear hellscape. It's set to release on February 15.

Dark Souls creator takes the Lifetime Achievement award

THE GAME AUTEUR BEHIND DARK SOULS AND BLOODBORNE TAKES TOP HONOURS.

During the Golden Joystick Awards 2018, FromSoftware's visionary director Hidetaka Miyazaki won the Lifetime Achievement award for his outstanding contributions to the industry. Miyazaki directed such influential games as the *Dark Souls* series and *Bloodborne*, which redefined how players and developers alike approach difficulty and worldbuilding in games. As the latest winner of the Lifetime Achievement award, Miyazaki joins the ranks of esteemed video game luminaries like Hideo Kojima, Sid Meier, and the late, great Satoru Iwata. ■



$69 | PC, PS4, XBOX ONE | FALLOUT.BETHESDA.NET

Fallout 76

A gaming wasteland.

The irony of *Fallout 76*'s narrative can't possibly pass you by as you take the first tentative steps into its considerable world map. This is a game about disaster and desolation told, quite inadvertently, by disastrous design and a desolate core gameplay loop. Irradiated hounds with rusted bicycles glitched through their bodies as if skewered by the force of the bomb blast; building after deserted building with nothing beyond audio tape logs or computer terminals to interact with; exchanging emotes with passing strangers before returning to the lonely business of running between quest markers. It's a multiplayer experiment whose own developers never seemed totally confident in at its conference showings, and which reveals itself to be fundamentally flawed after just a few hours of play.

Far from the traditional solo RPG the series' name conjures, this is shared-world survival in Pip-Boy cosplay. Up to 24 players can inhabit one iteration of the world map, which is geographically at least as interesting as those of *Fallout 3* and 4. And those players can impact the world significantly, in theory.

The reality, inevitably, is that you want *Fallout 76* to play like a *Fallout* game, and on those terms it fails to satisfy. But from the second you wake up in Vault 76 and enter a character creator near-identical to its 2015 predecessor's, you have the unshakeable sensation that you're playing someone else's *Fallout* game. A save file in which they have completed every quest and killed every single NPC, and never load up any more, because there's nothing left.

And so you wander out of the deserted vault, into an equally barren wilderness, tasked with hours of quests that amount to nothing more than reaching a map location, listening to an audio log and then either crafting or killing something, in almost completely unbroken silence. When you do bump into another player the interactions are almost always flimsy – an exchange of admittedly well-integrated emotes before going your separate ways, or an ignored headset mic salutation.

Amid the mess, you find moments of beauty and wonder. The audio logs, such as they are, tell a thoughtful, well-paced tale of Vault 76's first colonists meeting a hostile landscape they weren't prepared for, and being torn to shreds by the local flora and fauna. Given that *Fallout 76* is constructed so brazenly from the component parts of *Fallout 4*, there'll be loud and angry voices who'll have it that this is Bethesda simply hitching itself to the game-as-service bandwagon without any discernible creative or artistic imperative to match that commercial ambition. Out there in the miles of lonely wasteland, there's barely a dissenting voice to be found. ■ APC team

Verdict

A thorough lack of understanding of why people play online.

★★☆☆☆

$69 | PC, PS4, XBOX ONE | ORIGIN.COM

Battlefield V

Does a classic of its genre still deserve the accolades?

Battlefield V as it stands is a game of absences, for better and worse. There are the reassuringly perilous open spaces of its eight multiplayer maps, which reach across WW2 Europe from Norwegian slopes to the shimmering plateaus of North Africa, and which rank among the best DICE has ever created. The radiant Hamada map, in particular, is almost offputtingly uncluttered, its northernmost Conquest flags separated from the others by a gorge which gives snipers the drop on any would-be Montgomery fool enough to rush the bridge.

Battlefield has never been celebrated for its singleplayer, and the fifth game's War Stories do little to improve its standing. They're essentially a thinly narrativised introduction to multiplayer gadgets and mode rulesets, spiced up by a focus on less-known aspects of the war but too ham-fisted to do their occasional promise justice. The opener stars Billy Bridger, a bit-part from a straight-to-VHS Cockney heist movie who is somehow recast as a special

forces hero. A series of stealthy search-and-destroy missions against dim-witted Germans, his missions are as tedious as the voice-acting is hysterical.

If *Battlefield V*'s campaign is too dull for its own good, its multiplayer has never been more sociable. Players now spawn into a four-head squad by default, regardless of mode, and while you're free to range at whim, there are powerful incentives to stick together. As in previous games, squadmates can spawn on each other, shaving precious moments off the trip from base to frontline. *Battlefield V* feels more significant for its adjustments to DICE and EA's business model than what it actually achieves at the level of play: it's more a question of stretching the same components across different production timeframes than meaningfully changing them. The possibilities of fortifications and the rejuvenated squad system will be alteration enough for returning fans, but won't attract many new converts, and the singleplayer is a watery afterthought.

■ APC team

Verdict

Not enough to truly excite, and forget it if you just want single-player.

★★★☆☆

Cube Escape: Paradox

Play and watch this game.

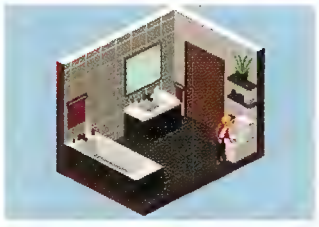
PC | FREE | BIT.LY/CUBEPARADOX

It's only been three years since the first *Rusty Lake* game, but we're already on our 13th puzzler set in the macabre world. The latest game, *Paradox*, belongs to the *Cube Escape* sub-series, meaning it's shorter, and free, and tasks you with escaping, yes, a room by pointing and clicking. Where *Paradox* differs from previous entries is its presentation. It's a little more polished, and a tiny bit more story-focused.

As part of a murder investigation, your detective has to prod at lamps, open drawers, and use objects in unusual ways – if you've played previous entries, there will be little here you haven't seen before. And if you haven't had the pleasure, these games are popular for a reason: Each offers an engrossing clockwork world to explore for an hour or two.

Paradox is unusual in that it includes a free short film. It captures the game's Lynchian atmosphere perfectly. With a set reconstructed in near-perfect detail from that in the game, you can watch the film for a few tips, and to flesh out your understanding of the surreal story. ■ Tom Sykes

★★★☆☆



Behind Every Great One

A complex study of marriage and family dynamics.

PC | FREE
BIT.LY/BEHINDGAME

Here you explore life from the point of view of a woman lost in her self-obsessed artist husband's shadow. It's a game about the more subtle, insidious side of sexism, where it's felt in the atmosphere, and rarely brought to the surface where it can be confronted and, hopefully, tackled. Each day in this brief adventure is a procession of futile tasks – no matter what you do, whether it's the cooking or dusting the floor, every day you'll be belittled and criticized by your family.

As you can imagine, it gets fairly tiresome, doing all that housework, day after day – and that exhaustion is mirrored in the behavior of protagonist Victorine. At some point most days she'll break down and burst into tears, before wiping her eyes and carrying on with her lonely life.

But Victorine refuses to break down in front of her family, so you will need to steer her to an empty room in order to cry. These scant moments of expression are desperately sad and they build over the course of the game towards a perfectly judged, cathartic conclusion. ■ **Tom Sykes**

$15 | PC | BADNORTH.COM

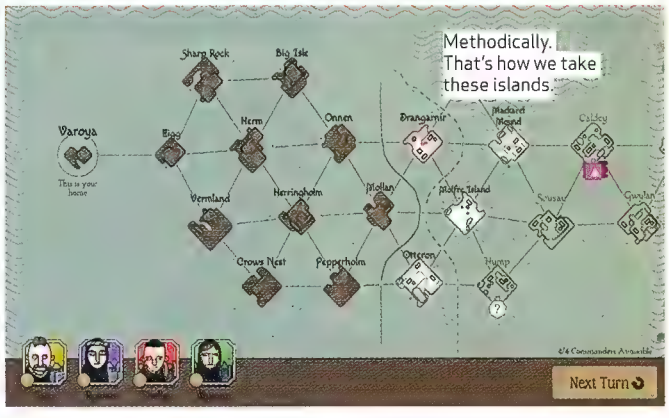
Bad North

A cute strategy game with dire consequences.

It's a simple strategy game, almost closer to being a puzzler. You have to defend a little island, or more specifically the cottages dotted around it. You have up to four units to hold off waves of Viking invaders. *Bad North* is about shuffling units around to make sure someone is on the beach ready to greet approaching enemies. Complications arise with more frequent waves and various enemy types requiring different units to counter. The key to each battle is teasing out the choke points on the islands – placing your troops where they can make the most difference without wasting time marching them from one end of the island to the other.

Your units are groups of eight or so little dudes and with each fight they diminish. You need to send them to a house to replenish or risk losing them forever, but while they're recovering their numbers they're unable to respond to any attackers. Making the call at the wrong time will cost you gravely. Lose all your units and it's game over, sending you back to square one. It's an extremely harsh punishment for a game with such gentle presentation. Moving troops feels like playing with a small box of toys. The soft wind and waves make each island feel like a lovely little haven, the cottages dotting the islands adding to the wholesomeness. It's all so simple and evocative. You respond to oncoming attackers carefully, but easily. A nice alternative to more demanding strategy games. Yet that all turns on a dime with one single mistake. The consequence of failure feels at odds with the leisurely pace of combat.

If you can stomach the harsh consequences for failure then *Bad North* is a delightful little strategy game. I keep restarting in spite of my mistakes, so that speaks volumes for how compelling it is. There's just something about watching those little sprites batter each other that keeps me coming back. At least until I burn my house down. ■ **Sam Greer**



Verdict

Bad North is a fun alternative to more complex strategy titles.

The clever UI looks like serious hacker business.

\$20 | PC | ZACHTRONICS.COM/EXAPUNKS

Exapunks

Spending too much time on your computer makes you cool.

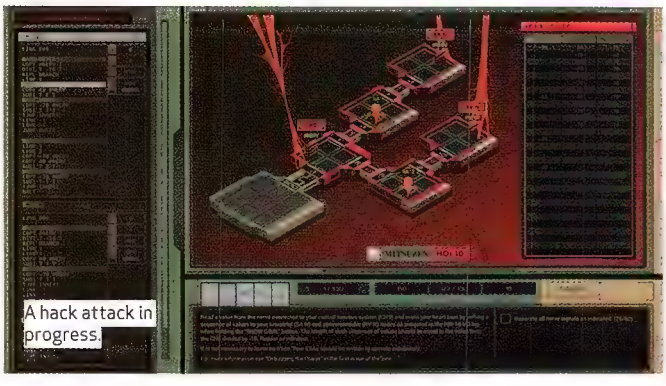
My EXA, a digital bug-looking thing made of code, scurries out into rooms representing nodes in a factory's network. Following the program I painstakingly wrote for it, the EXA disrupts this network with precision before running the HALT command to self-destruct. There is no trace of the fact I have hacked this factory, except that the snack bars it produces no longer contain peanuts. It's the little victories.

Exapunks is the latest game from Zachtronics, creator of tricky puzzle games such as *Opus Magnum* and *Infinifactory* that are all about moving things from one place to another, and hacking games such as TIS-100 that are all about typing made-up but believable code into computers. *Exapunks* connects the two, providing space for code and a visualisation of that code's effect, which is mostly moving things about.

This is a game that requires a kind of programmer thinking you either have or you don't, and as someone who very much doesn't, I needed help. My solutions are ugly and often involve multiple EXAs programmed with slight variations on the same code to deal with every possible eventuality. Cleverer players use commands like REPL to make replica EXAs containing cloned code that doesn't hurt their score. They're efficient in ways I not only don't think of, but never would.

The programming language is robust enough it can even be used to make games within the game. When I got hold of a Game Boy-looking handheld called the Redshift I could write my own games onto it, and play ones made by other people when solving puzzles started to feel like work.

Exapunks is a two-coffee game, one that requires focus. Even then, there's a hard limit on how good I'll ever be. I feel out of my depth, like a smart dog who graduated puppy school and has been put in a physics class. *Infinifactory* and *Opus Magnum* remain the Zachtronics games I'd recommend, but if you aced both of those and are ready to graduate, *Exapunks* is the next level. ■ **Jody Macgregor**


A hack attack in progress.

Verdict

It will make you feel like a genius or an idiot -- sometimes both in quick succession.

★★★★☆

Return of the Obra Dinn

A mystery set aboard a lost ship.

PC | \$20
OBRADINN.COM

This is a first-person puzzle game from Lucas Pope, creator of *Papers, Please*. It's rendered with a bold art style that recalls the dithered visuals of Macintosh adventure games. But *Obra Dinn* is no less atmospheric for it. In fact, the sense of place created by its hard lines and limited palette is quite remarkable.

You'll find bones of the former crew, and using the watch near them will whisk you away to a detailed vignette of the seconds before they died – be it an unfortunate accident, a brutal murder or something weirder.

Return of the Obra Dinn is a stunningly clever thing, and one of the best puzzle games on PC. It not only presents you with a complex mystery to crack, but trusts in you enough to let you do it yourself with almost no markers or guides. Few games have this much confidence in the player, and it's a satisfying experience, even if I did occasionally feel like I'd hit a dead end. ■ **Andy Kelly**

★★★★☆

DEVELOPER: UBISOFT MONTREAL **PUBLISHER:** UBISOFT **RELEASED:** 13 NOVEMBER 2007 **SYSTEM:** XBOX 360, PS3

GAME CHANGER

Assassin's Creed

Remembering the real origin story of one of gaming's biggest franchises a decade on from its debut.

The biggest franchises often have the humblest of beginnings. For Ubisoft, the road to establishing a billion-dollar brand began in 2003. Production had wrapped on *Prince Of Persia: Sands Of Time* and a team of aspiring developers, engineers and programmers were immediately tasked with taking the beloved action-platformer to the next level, envisioning a sequel that was bold, expressive and innovative. It didn't go as planned and they may have accidentally killed the series entirely. But what arose from the ashes was far greater and more potent in the marketplace, with the power to entice audiences outside of videogames, its allure seeping out into everything from cinema and comics, to toys and anime.

Assassin's Creed was born out of *Prince Of Persia: Assassin*, a game framed around a young boy, a prince, with special powers being captured by a dangerous new threat to Jerusalem. You were to embody the role of a deadly assassin, hellbent on securing the prince's safe passage home to the throne. The core concept came from the mind of *Sands Of Time* creative director Patrice Désilets, inspired by tales of Hassan-i-Sabbah, an Eleventh century missionary who was said to have founded the Asasiyun – or as we know them today, the assassins.

Ubisoft liked it, but was ultimately confused: why had Désilets and a small team of 20 spent a year in pre-production on a title that didn't feature the Prince in a leading role? Instead of scrapping it entirely, Ubisoft allowed the *Sands Of Time* veterans to continue on the road it had started down and, in November of 2007, we had our first taste of it: *Assassin's Creed* landed and gave us an insight into the generation's most exciting development, the advancement of the open-world sandbox.

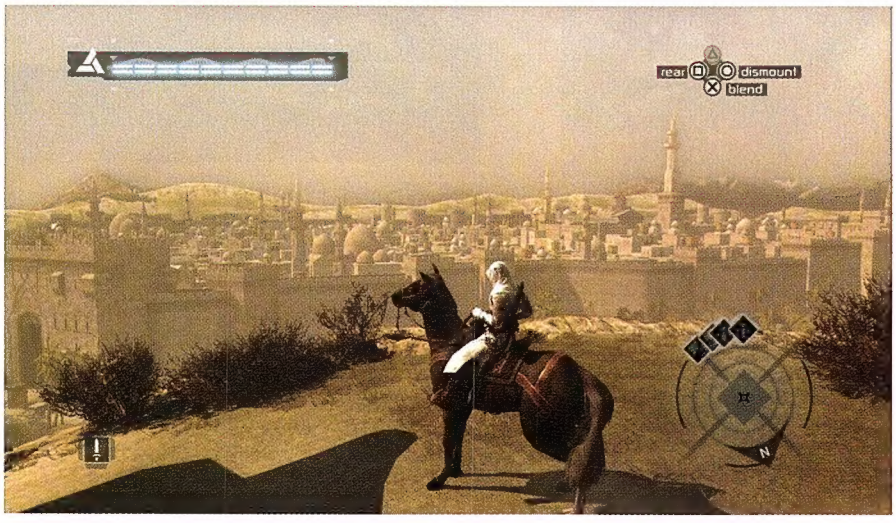
Across the game's three-year development cycle, the team had swollen from 20 to 120; the Scimitar engine had been created from scratch (known now as Anvil, a variation of it

Key facts

- *Assassin's Creed* was originally going to include a crossbow, but Ubisoft determined that ranged combat made the game too easy, not to mention historically inaccurate. You can even see it in the game's opening trailer on the menu.
- Altaïr is one of the only members of the order to have a missing finger. While Ubisoft has never confirmed why this is the case, it's believed that the master assassin cut his own off to accommodate a hidden blade of his own design.

Marionette strings

An ode to the Animus and how it justified the world of creed.



Looking at it today, the Animus seems like the perfect MacGuffin; a device that lets Ubisoft take us to anywhere in the world, to any period of known history. The science fiction and real-world elements may have become tempered in recent years, but back in 2007 it was integral to *Assassin's Creed*. The machine let Desmond experience the memories of his assassin ancestor Altaïr, working to explain away many of the idiosyncrasies of the experience. Repetitious dialogue and strange accents? A result of the Animus attempting to translate everything into English for Desmond. Game bugs and boring mission design? You are simply seeing streamlined fragments of Altaïr's memories. Cumbersome movement options? That's because Desmond is merely controlling Altaïr – each input on your controller corresponding to limbs rather than action directly, part of the unique Marionette input system. *Assassin's Creed* worked so hard to justify its fiction, in many ways it's a shame that that has disappeared over the years.

continues to power the AC games to this day), designed to house all of the components of this insanely ambitious open-world title. It might not look like much now, particularly when played next to 2017's stunning *Assassin's Creed Origins*, but back in 2007 we hadn't seen anything like it before – it was a true showcase to the power and potential of the Xbox 360 and PlayStation 3 consoles.

A new engine and story were just the beginning. At the heart of *Assassin's Creed* was to be its sandbox world, an element of its construction that has truly stood the test of time. Set in the Middle East during the Third Crusades, Ubisoft Montreal ushered in elements that were to be truly revolutionary for the time. This was to be a world that you didn't just pass through, but could inhabit entirely; a protagonist would take centre stage that was intimately familiar with their surroundings, able to freely traverse the environment with ease – storming through alleyways, scaling buildings and bounding across rooftops with wild abandon. *Assassin's Creed* may have ultimately suffered due to repetitious mission structure and loose combat mechanics, but its world and the AI that inhabited it impressed none the less. We were given the freedom to choose, not only how we were going to assassinate nine leading Templars, but in how we would approach them too – across a world that felt as if it were actually alive.

Enemy AI would be able to detect where you were and where you intended on going, the path-finding was advanced enough that it could track you across different planes of height and across sprawling distances as you headed out of the city walls. Ubisoft would also push its stealth elements out from the tightly scripted scenarios seen in *Splinter Cell*, focusing on what it called 'social stealth' – or the ability to blend in with your environment to dodge guards, divert attention and covertly track targets in the open-ended environments. Becoming lost as part of a crowd – gently pushing through the bustle of a busy street – highlighted a breadth and quality of animation that console players had rarely been treated to before this game.

Assassin's Creed was as perfect a melding of art and design as you could hope to see in 2007. It set a standard that most every developer looking to build out open-world sandboxes in the decade to follow would study delicately; the construction of the city and the variety of systems at play every step of the way was truly astounding, when you think about it.

Ubisoft successfully constructed one of the biggest franchises in the videogame world in *Assassin's Creed* and its influence is still felt across the industry. Its fiction may have become labyrinthine – bordering on parody – in the intervening years, and the size of its worlds swollen to the point that the studio struggles to properly optimise them. But at the heart of it all is this divisive 2007 gem. In spite of its flaws, there are flashes of brilliance in its design, *Assassin's Creed* advanced stealth systems and sandbox open world, and for that we will always be thankful. ■

» JOEL BURGESS REPORTS ON THE UNUSUAL SIDE OF TECH NEWS.

Huawei CFO facing extradition to US for breaking trade sanctions

Tech company executive at the centre of political hotcake.

Huawei's chief financial officer and daughter of Ren Zengfei, the company's founder, Meng Wanzhou is at the centre of political escalations between the US and China after being detained in Vancouver, Canada on December 1st. Wanzhou was awaiting proceedings for an extradition hearing after being accused by the US of attempting to conceal Huawei's alleged trade dealings with Iran in 2013 from US banks, which caused them to break US and UN trade sanctions. The Chinese Vice Foreign Minister Le Yuchenghas threatened Canada with "grave consequences" if it didn't release Meng immediately. The political conflict comes only months after the US banned Huawei and ZTE devices from the US.

China bans iPhones following Qualcomm patient dispute

COURT ORDER PREVENTS SALE OF IPHONE 6S TO THE IPHONE X.

Apple and Qualcomm have a number of ongoing disputes in courts around the world, but one court in China ruled in December to prohibit the sale of Apple's smartphones released between 2015 and 2017 on the basis of a patient infringement. The court order prohibits the sale and importation of the iPhone 6s and 6s Plus, the 7 and 7 Plus, the 8, 8 Plus and the iPhone X. The court order doesn't go as far as halting local production and export of these devices, but it is still a considerable hinderance to Apple's business in China. The two patent infringements are software based so it's possible that an update could undo the ban.

World-first anti-encryption bill has been passed in Australia

TECH COMPANIES RESPONSIBLE FOR DECRYPTING COMMUNICATIONS OF SUSPECTED CRIMINALS.

Australia is leading the way in giving local authorities the power to coerce tech companies to decrypt communications of users suspected of serious crimes like terrorism, child sex offences or drug and gun-related crimes with penalties greater than three years of gaol time. This bill has passed both houses of parliament and while, Labor agreed to the bill with some constitutional amendments, the fundamental laws have already ascended to legislation with only a few elements requiring a 28-day notification period before taking effect. An international consortium of tech companies including Apple, Google and Microsoft have condemned the bill as "overly broad and lacking in independent oversight".

Tech authority believes AI toilets are the future

AI'S LATEST MOVEMENT INVOLVES YOUR BOWEL MOVEMENTS.

With the closure of Lexar, Micron's consumer facing external memory brand, some may say the company is headed down the toilet – And Micron CEO, Sanjay Mehrotra, would have to agree. The next big frontier that Micron is eager to get onto, according to Mehrotra, is the AI toilet. The head of the semiconductor manufacturer elaborated at the 2018 Techonomy conference, saying, "smart toilets in the future will be analysing human waste in real time every day. If any sign of disease starts showing up, you'll be able to catch it much faster because of urine analysis and stool analysis." ■

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